Status of 10 Bird Species of Conservation Concern in US Fish & Wildlife Service Region 6: Volume III

Draft Report to:

United States Fish & Wildlife Service, Region 6
Denver, Colorado

By

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Marbled Godwit (*Limosa fedoa*)

Figure 1. Marbled Godwits can be quite vocal when they notice an intruder near their nest. Photo by Chris Butler

Summary:

- Marbled Godwits are large shorebirds that may be relatively common on northern prairies in North America. During the breeding season, they are a warm brown with dark brown streaks on the breast, a dark brown speckled back. During the non-breeding season, Marbled Godwits lack the streaking on the breast. They have a bicolored bill and cinnamon brown underwings year-round.
- Marbled Godwits nest in three distinct regions, with 80% of the population breeding from Minnesota north to Manitoba and west to Alberta and Montana. They also breed near the southern James Bay and on the Alaska Peninsula. Marbled Godwits winter from Washington on the west coast and North Carolina on the east coast, south to Venezuela.
- There are an estimated 170,000 individuals. Within Region 6, Marbled Godwits are listed as a Level I / Tier I species (i.e., a species in greatest conservation need) in North Dakota, South Dakota, Colorado, and Kansas. They are listed as a Level II / Tier II species (i.e.,a species in need of conservation) in Montana.
- Breeding Bird Surveys from 1966-2012 show no change in populations rangewide. However, there has been a 2.1% annual increase in Region 6 over that time span.
- Christmas Bird Counts during 1966-2012 show a 0.35% annual decline.
- Overhunting during the 19th century caused the population to decline and the range to contract. Habitat loss prevents this species from reoccupying all of its original range.

Legal Status:

The Migratory Bird Treaty Act (MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA protects any migratory bird under 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Status rangewide is summarized by Tables 1 and 2.

Description

Marbled Godwits are large shorebirds with long bicolored bills (Figure 1; Gratto-Trevor 2000). The underwings and remiges are cinnamon colored, while the outer primary feathers are brown (Gratto-Trevor 2000). Breeding and basic plumage are similar, except for paler underparts and relative lack of barring (Gratto-Trevor 2000). Females are larger than males and have longer bills, typically with a culmen length ≥ 180 mm, but both sexes appear similar (Gratto-Trevor 2000, Ayala-Perez et al. 2013). Juveniles are unstreaked and pale (Gratto-Trevor 2000).

There are two recognized subspecies of Marbled Godwit: *Limosa fedoa fedoa* breeds in the northern prairie states and Canada while *L. f. beringiae* breeds in Alaska and winters along the West Coast (Gibson and Kessel 1989, Gratto-Trevor 2000).

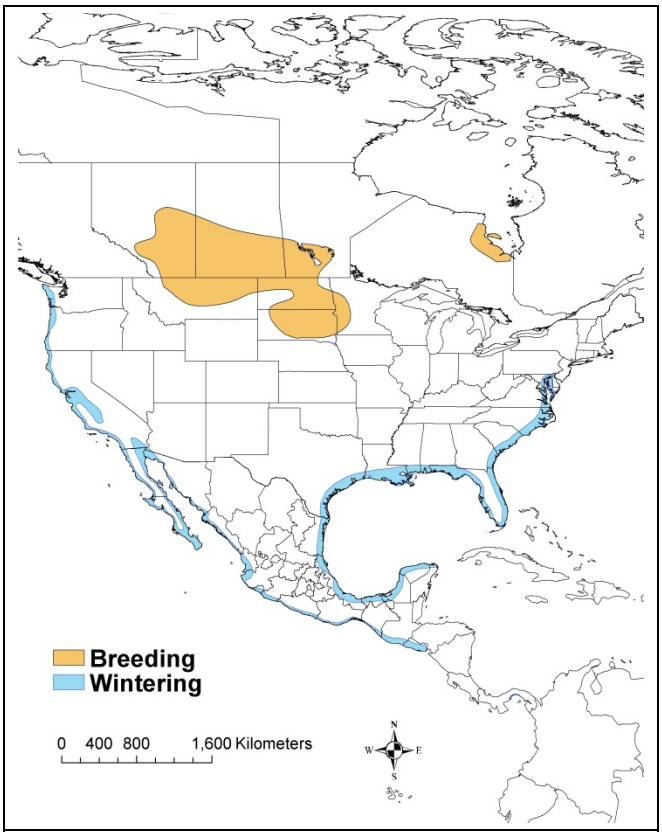

Figure 2. Marbled Godwits breed in central North America and winter along the coasts, south to Central America. The population breeding on the Alaska peninsula is not shown. This map was created using data provided by BirdLife International and NatureServe (2012).

Distribution

Rangewide

Marbled Godwits breed in three disjunct areas; the largest (80% of the population; Niemuth et al. 2013) is the north-central United States and south-central Canada (Gibson and Kessel 1989, Gratto-Trevor 2000, Olson et al. 2014; Fig. 2). This area includes portions of Manitoba, Alberta, and Saskatchewan, Montana, northwestern Minnesota, North Dakota, and South Dakota. Historically, Marbled Godwits also bred in Wisconsin, Iowa and Nebraska (Melcher et al. 2010). Approximately 1,000-2,000 birds also breed along the southern portion of the Hudson Bay (James Bay) in Ontario and another 1,000-3,000 birds breed on the Alaska Peninsula in southern Alaska near Ugashik Bay (Gibson and Kessel 1989, McCaffery 1996, Gratto-Trevor 2000).

Marbled Godwits winter locally along the Pacific Coast in Washington, Oregon, and California, as well as inland California and Nevada (Gratto-Trevor 2000), and can be one of the most abundant shorebirds in some areas (Hubbard and Dugan 2003; Neuman et al. 2008, Lafferty et al. 2013). Rarely, Marbled Godwits winter in Columbia, Ecuador, Peru, and Chile (Gratto-Trevor 2000). On the Atlantic Coast, Marbled

Godwits rarely winter from Massachusetts south to Virginia. They are regular winter visitors from North Carolina to Florida, the Gulf Coast, and the eastern coast of Mexico. Marbled Godwits irregularly winter south to Venezuela (McNeil et al. 1985; Gratto-Trevor 2000) and winter regularly near Chacopata Lagoon in eastern Venezuela (Mercier et al. 1987). Color-banding as well as satellite tracking demonstrated prairie populations winter along the northwestern Mexico coast as well as the southeastern U.S. (Gratto-Trevor 2011, Olson et al. 2014).Satellite tracking of a few *L. f. beringiae* found that they wintered in California (Andres et al. 2012).

Region 6

Colorado: In general, Marbled Godwit is only found in Colorado during migration (Andrews and Righter 1992, Kingery 1998). However, Colorado has one breeding record with four eggs from 1984.

Kansas: Marbled Godwits migrate through the central part of the region irregularly in the spring and fall. Peak migration in the spring occurs in late April and early May. Peak fall migration occurs in August. (Thompson et al. 2011). Cheyenne Bottoms Wildlife Management Area is considered to be an important stopover site for this species (Melcher et al. 2010).

Montana: Marbled Godwits breed in Montana and can be found April-September. They are found primarily in the northern part of the state, most densely in Phillips and Valley counties (Montana Bird Distribution Committee 2012, Montana Field Guide 2014). They can be found at Bowdoin National Wildlife Refuge in upland areas, Freezeout Lake Wildlife Management Area, and Benton Lake (Johnsgard 2011). Marbled Godwits are transient throughout the state. The peak of migration in Montana occurs on 10 May and 15 September (Montana Field Guide 2014).

Nebraska: Pre-1900 breeding range extended into Nebraska (Gratto-Trevor 2000). Now, Marbled Godwits occur in Nebraska only during migration. Spring migration records are uncommon, while fall migration records are rare and restricted to the panhandle area. Spring migration peaks in mid-April and fall migration peaks in July. One breeding record from 1990 was recorded near South Dakota in Dawes County. Marbled Godwits are found most often in Rainwater Basin Wetland Management District and Clear Creek State Waterfowl Management Area (Sharpe et al. 2001).

North Dakota: Marbled Godwits are fairly common during spring and summer, but are uncommon during the fall (Faanes and Stewart 1982). Marbled Godwits are often found in the Missouri Coteau region in North Dakota. They are uncommonly found in the drift plains in the eastern part of the state, including sand plains of the Agassiz Lake Plain Region. They breed in native prairie or wetlands from mid-April to mid-July (Stewart 1975).

South Dakota: Marbled Godwits irregularly breed from the end of May through July. They are summer residents throughout the central and northeastern portions of the state (South Dakota Ornithologists' Union 1991, Tallman et al. 2002). Marbled Godwits are often reported in the Missouri Coteau in the north central part of the state (Peterson 1995). Gardner et al. (2008) noted that they are most common in the northeastern and north-central portions of South Dakota.

Utah: Marbled Godwits are a common transient in Utah during migration (Utah Bird Records Committee 2013). They are typically observed in the northern third of the state (Utah Conservation Data Center 2013). Bear River Migratory Bird Refuge is a migratory stopover site (Olson et al. 2014).

Wyoming: Marbled Godwits are an uncommon migrant through Wyoming in the spring, summer, and fall. Fewer individuals are present during the fall than the spring and summer. There is one breeding record in Yellowstone National Park. Spring migrants arrive in mid-April and fall migrants leave by mid-September. Most migrants are recorded in the eastern part of the state (Faulkner 2010, Johnsgard 2011).

Biology

General

Marbled Godwits feed on a wide variety of items during the breeding and wintering seasons, but rely heavily on polychaetes. They will also feed on mollusks, gastropods, crabs, insects, worms, and small fish (Gratto-Trevor 2000). Marbled Godwits rely on bivalves during the winter and spring, and will feed upon introduced Asian mussels (*Musculista senhousia*; Kushner and Hovel 2006) and polychaetes in the fall (Gratto-Trevor 2000; Navedo et al. 2012). Individuals feed mostly at night during the fall and during the day in the winter (Dodd and Colwell 1996, Dodd and Colwell 1998). Tidal exposure of mud flats may influence foraging behavior during the winter (Dodd and Colwell 1998; Navedo et al. 2012). Marbled Godwits rely on tactile cues for foraging (Dugan et al. 2003).

Breeding Marbled Godwits give three calls; a *whit* or *wik*, a *rad-i-ca*, and a *craack*. The *whit* call is primarily given by males in territoriality displays, while the *wik* is a call to young. The *rad-i-ca* call is one of courtship given by both sexes. The *craack* call is one of distress. Calls during the non-breeding season are nasal and sound like laughter (Bent 1907, Gratto-Trevor 2000).

Marbled Godwits also engage in several displays including the Ceremonial Circling Flight, the Wing-up Display, and pair bond displays. Ceremonial Circling Flight is presumably a courtship display that involves males circling the area giving the *ger-whit* call. The Wing-up Display involves outstretching the wings over the head and is often associated with the circling flight display (Gratto-Trevor 2000). Godwits are also known to distract potential predators with displays and vocalizations (Bent 1907, Gratto-Trevor 2000).

Breeding

Marbled Godwits pair up in late April or early May. Males initiate nest sites by scraping the ground and females choose (Gratto-Trevor 2000). Marbled Godwits nest on the ground in areas with short grass; nests are not well concealed (Bent 1907). Both sexes add nest materials, including grasses and lichen (Gratto-Trevor 2000). Marbled Godwits lay four buffy or olive-blotched eggs (Bent 1907, Gratto-Trevor 2000), and have only one brood per season. Intraspecific nest parasitism is rare but has been observed (Colwell 1986). Both parents incubate eggs, and incubation lasts 24-26 days before the first eggs hatches (Garvey et al. 2013). Young are precocial and will peck at vegetation. Chicks are able to leave the nest within one or two days of hatching (Gratto-Trevor 2000).

Wintering

Adults flock together and migrate before juveniles (Bent 1907, Gratto-Trevor 2000). Olson et al. (2014) suggested that separate populations have differing migration strategies. On the wintering grounds, Marbled Godwits can be found in mixed-species flocks of Long-billed Curlew (*Numenius americanus*), Hudsonian Godwit (*Limosa haemastica*), Whimbrel (*Numenius phaeopus*), and Willet (*Tringa semipalmata*). No winter territoriality has been observed. Pairs do not winter together (Gratto-Trevor 2000). Distribution on the winter grounds is random (Colwell and Sundeen 2000).

Habitat

Breeding

Marbled Godwits breed in the northern prairies of the United States and Canada (Gratto-Trevor 2000). They require grassland and wetlands of varying structure and type including ephemeral to semipermanent ponds (Gratto-Trevor 2000). Marbled Godwits prefer short, native grasses (Bent 1907) including green needle grass (*Stipa viridula*) needle-and-thread (*S. comata*) and little bluestem (*Andropogon scoparius*), but will also use hay fields including alfalfa (*Medico sativa*) and others (Ryan et al. 1984, Gratto-Trevor 2000). However, Marbled Godwits do not use dense cover when nesting (Gratto-Trevor 2000). In some areas in North Dakota, Marbled Godwits will utilize grazed prairie (Ryan et al. 1984, Gratto-Trevor 2000). Garvey et al. (2013) found that Marbled Godwits were less selective than Willets or Upland Sandpipers (*Bartramia longicauda*) and use most habitat that was available for nesting. Marbled Godwits tend to exhibit greater site faithfulness than American Avocets (*Recurvirostra americana*) and Black-necked Stilts (*Himantopus mexicanus*; Colwell 2010).

The James Bay population utilizes open taiga and tundra with small shrubby vegetation such as tamarack (*Larix* spp.; Gratto-Trevor 2000). They will also utilize coastal wetlands. The Alaska breeding population prefers blue joint grass (*Calamagrostis canadensis*) with sedges and small willows (Gratto-Trevor 2000).

Migration

During migration, Marbled Godwits prefer to flock around wetlands (Gratto-Trevor 2000). Some individuals use lake shores and marshes, while others prefer temporary wetlands (Gratto-Trevor 2000).

Winter

During the winter, Marbled Godwits utilize mud- and sand-flats, beaches, estuaries, and their adjacent savannas or fields (Gratto-Trevor 2000). Long and Ralph (2001) found that Marbled Godwits in fall and winter in northwestern California would utilize fields at higher tides when mudflats were covered.

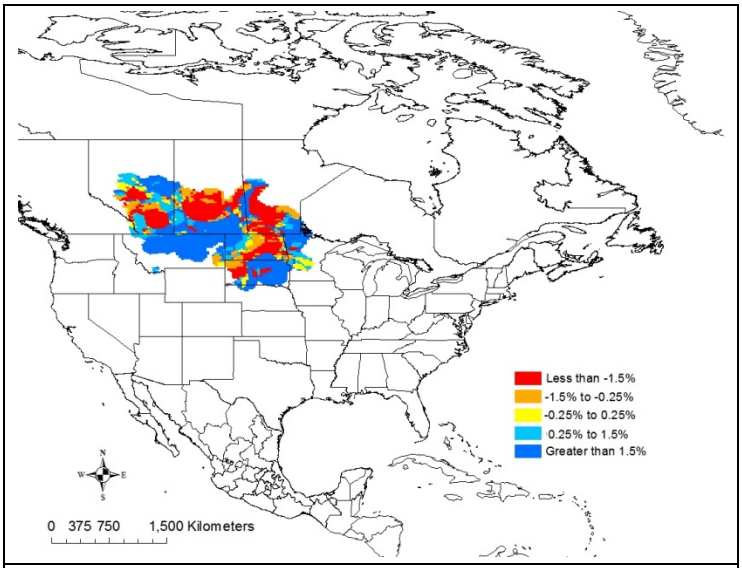

Figure 3. Map of percent change per year in the number of Marbled Godwits detected during the Breeding Bird Survey for the period 1966 – 2012 from Sauer et al. (2014).Population increases are noted on the southern and eastern edge of the range, while populations at the northern edge are generally declining.

Population Trends and Estimates

Melcher et al. (2010) summarized population estimates that ranged from 140,000-200,000 individuals. More recently, Andres et al. (2012) estimated that the population consisted of 170,000 individuals. Based on Breeding Bird Survey data, Marbled Godwits exhibited no change rangewide or within Region 6 (Table 2). However, a significant increase has been noted in Montana and South Dakota (Fig. 3, Table 2). In contrast, Christmas Bird Count data suggest a 0.35% decline since 1966 (linear regression, $F_{1,45} = 20.11$, $R^2 = 0.294$, $p < 0.001$; Figure 4).

Threats

Habitat degradation and conversion

The quality and quantity of

North American grasslands have declined severely (Browder et al. 2002). Marbled Godwits avoid areas that have been cultivated. They also avoid some areas with dense cover managed for waterfowl (Gratto-Trevor 2000).

Additionally, weather may have adverse effects on Marbled Godwits. Hurricane Hugo, while not directly affecting the population, degraded wintering habitat available at Cape Romain NWR in South Carolina (Marsh and Wilkinson 1991).

Hunting

Substantial population declines occurred in the 1800s before the Migratory Birds Convention of 1916, which made it illegal to shoot Marbled Godwits (Gratto-Trevor 2000).

Insecticides and toxins

Marbled Godwits are threatened by the use of insecticides in their breeding range. Insecticides have both direct and indirect effects; they can possibly affect growth and development as well as reduce the amount of food availability (Gratto-Trevor 2000). At least two records of lead poisoning have also been recorded in Marbled Godwits (Gratto-Trevor 2000).

Parasites

Bartlett (1993) found that lice were vectors of transport for *Eulimdana* parasites in Charadriiforms (shorebirds). *E. wongae* was found in three species of lice (n = 119 individuals) collected from a single Marbled Godwit.

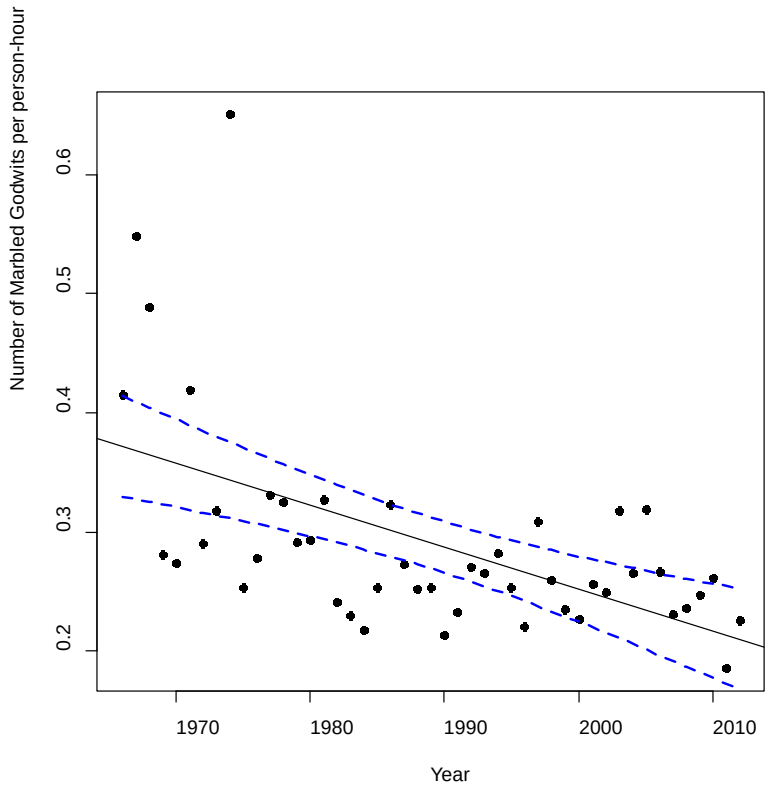

Figure 4. The number of Marbled Godwits detected per party-hour during Christmas Bird Counts in the US and Mexico for the period 1966-2012 declined at a rate of 0.35% per year (linear regression, number per party-hour = -0.0035*year + 7.2879). This figure was created using data from the National Audubon Society (2014).

Collisions

Power lines through wetlands have caused injuries and fatalities. Adults are vulnerable during territorial disputes, mating, and care of young (Gratto-Trevor 2000). There was one record in 2007 of a Marbled Godwit colliding with a Southwest Airlines Boeing 737. At 3,700 m, this is the highest recorded altitude of any godwit species (Dove and Goodroe 2008).

Effects of Climate Change

Murphy-Klassen et al. (2005) found that arrival dates of Marbled Godwits at Delta Marsh, Manitoba were influenced by temperature, although interestingly warmer temperatures resulted in later arrival dates. Gardali et al. (2012) suggest that birds breeding in wetlands may be sensitive to predicted changes in climate but the possible effects of climate change on

this species have not been studied. Climate change in the prairie pothole region is expected to cause an increase in temperatures as well as an increase in droughts (Ojima and Lackett 2002) which may reduce the amount of wetlands suitable for breeding. Steen et al. (2014) suggest that Marbled Godwits may lose approximately 57% of their currently suitable habitat. Galbraith et al. (2002) suggested that rising sea levels may reduce the amount of suitable intertidal foraging habitat by 20-70% at four important sites for shorebirds.

Effects of Energy Development

Loss of habitat due to development for oil and gas, roads, and pumps is a major threat to Marbled Godwits. However, machinery and vehicular disturbances had little effect on nesting birds in southern Alberta (Gratto-Trevor 2000). Niemuth et al. (2013) found that Marbled Godwits would still utilize wetlands less than 805 m from wind turbines.

Management

Recommendations for management for this species include preserving grassland and wetland habitat in the breeding range (Ryan et al. 1984, Gratto-Trevor 2000). Maintenance of coastal areas in the wintering range is also important and should be incorporated into management programs (Gratto-Trevor 2000). Avoiding construction of power lines, and oil and gas activity, through wetlands is recommended (Gratto-Trevor 2000).

Conservation

Marbled Godwits are on the State of the Birds Yellow Watchlist (Rosenberg et al. 2014). Marbled Godwits are a species of conservation concern based on habitat alteration and loss, low population sizes, vulnerability, and lack of knowledge (Gratto-Trevor 2000). The greatest threats faced by birds on their breeding grounds are continued habitat loss and/or degradation, while the greatest threats faced by Marbled Godwits during the non-breeding season include development, human disturbance, and mariculture (Melcher et al. 2010).

Completed and Ongoing Conservation Actions

The goal for the 2001 U.S. Shorebird Conservation Plan is to increase the number of Marbled Godwits to 258,500 individuals (Brown et al. 2001). The conservation plan for Marbled Godwits was summarized by Melcher et al. (2010). The U.S. Fish and Wildlife's Partners for Wildlife Program includes grassland easements which are vital for conserving this species. However, matching non-federal funds limit the number of landowners who can participate in this program (Melcher et al. 2010). Important wintering and stopover sites, such as the Ensenada de La Paz in Baja California have been recognized by the Western Hemisphere Shorebird Reserve Network as a critical area for approximately 25 species of shorebirds, including Marbled Godwit (Colwell 2010).

TABLE 1. Marbled Godwit status rangewide summarized by multiple listing agencies. IUCN is an abbreviation for "International Union for Conservation of Nature" and data comes from IUCN (2014), ABC is an abbreviation for "American Bird Conservancy" and data is from ABC (2012), and "PIF" is an abbreviation for "Partners in Flight" and data comes from PIF (2014). A hyphen (-) indicates a lack of data. For the ABC Conservation Assessment, "Secure" species have no immediate conservation issues, "Potential Concern" species have smaller populations or ranges or at higher rates of population declines, "Vulnerable" species deserve conservation attention, and "At Risk" species need more urgent conservation attention. The "Birds of Conservation Concern" row shows the Bird Conservation Regions (BCR) and US Fish & Wildlife Region where this species is considered to be of conservation concern (USFWS 2008).

IUCN	Least Concern
Federal listing	No
ABC Conservation Assessment	Vulnerable
Birds of Conservation Concern	BCR 2, BCR 5, BCR 9, BCR 11, BCR 12, BCR 13, BCR 17, BCR 19, BCR 22, BCR 23, BCR 26, BCR 27, BCR 30, BCR 31, BCR 32, BCR 33, BCR 37, USFWS Region 1, USFWS Region 3, USFWS Region 4, USFWS Region 5, USFWS Region 6, USFWS Region 7, USFWS Region 8, National
PIF	-

TABLE 2. Marbled Godwit status summarized by Natural Heritage rankings, BBS trends for 1966 – 2012, BBS trends for 2000 – 2012, and multiple listing agencies. SGCN is an abbreviation for "Species of Greatest Conservation Need". A hyphen (-) indicates a lack of data. For the natural heritage rankings, G = global and S = state, where S5 = secure (common, widespread, abundant, and lacking major threats or long-term concerns), S4 = apparently secure (uncommon but not rare, but with some cause for long-term concern, usually having more than 100 occurrences and 10,000 individuals), S3 = Vulnerable (rare; typically having 21-100 occurrences, or 3,000-10,000 individuals), S2 = Imperiled (typically having 6-20 occurrences, or 1,000-3,000 individuals), and S1 = Critically imperiled (typically having five or fewer occurrences, or 1,000 or fewer individuals). Natural Heritage rankings are only for breeding populations. For the BBS trends, data with an important deficiency are labeled as "Insufficient data". The BBS trends are annual changes. Numbers in parentheses are 95% confidence intervals.

	Natural Heritage Ranking	BBS Trend (1966 – 2012)	BBS Trend (2000 – 2012)	State Listing	SGCN
Rangewide	G5	-0.2% (-0.9, 0.5%)	0.5% (-1.2, 2.0%)	-	-
Region 6	-	2.1% (1.2, 2.9%)	1.9% (-0.6, 3.9%)	-	-
Montana	S4B	4.8% (2.3, 7.4%)	1.2% (-6.9, 6.7%)	-	Tier II
North Dakota	SU	0.6% (-0.5, 1.7%)	1.3% (-0.8, 3.8%)	-	Level I
South Dakota	S5B	3.6% (0.8, 6.1%)	3.2% (-4.3, 9.1%)	-	Species of Greatest Conservation Need
Wyoming	S4N	-	-	-	-
Colorado	-	-	-	-	Species of Greatest Conservation Concern
Utah	SNA	-	-	-	-
Nebraska	SNRN	-	-	-	-
Kansas	S2N	-	-	-	Tier I

Franklin's Gull (*Leucophaeus pipixcan*)

Figure 5. Franklin's Gulls nest colonially in the northern prairies. Photo by Wayne Lynch / All Canada Photo / Universal Images Group

Summary

- This small, dark-backed gull sports a black head and reddish bill during the breeding season. During the non-breeding season, the head is whitish, with a dark cheek and nape. Franklin's Gulls nest colonially in the northern prairies, with some colonies exceeding 10,000+ pairs.
- Franklin's Gulls breed from western Minnesota north to Manitoba and west to Alberta and Oregon. They winter primarily along the west coast of South America, from central Peru to central Chile.
- There are more than 1,000,000 individuals in North America. Within Region 6, Franklin's Gulls are listed as a Level I / Tier I species (i.e., a species in greatest conservation need) in North Dakota. They are listed as a Level II / Tier II species (i.e., a species in need of conservation) in Montana and Wyoming.
- Due to substantial fluctuations in number at colonies from year-to-year and difficulties in censusing colonial birds on the northern prairies, Breeding Bird Survey data should be used with caution. However, a significant rangewide decline of 4% per year during the period 1966-2012 was observed. This trend was mirrored in Region 6, where a significant decline of 4.4% annually was observed during the same time period. Franklin's Gulls winter primarily along the west coast of South America and are not well surveyed during Christmas Bird Counts.

Legal Status

The Migratory Bird Treaty Act (MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA protects any migratory bird under 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Status rangewide is summarized by Tables 3 and 4.

Description

Breeding Franklin's Gulls have a black head and a stout red bill (Godfrey 1966; Fig. 5). They have a dark gray back above and are white below. Their primaries are black, tipped with white (Bent 1963). They resemble Bonaparte's Gull but are larger in size (Godfrey 1966). The non-breeding plumage has a gray mantle and retains the blackish primaries with white tips. The tail is white with a gray center. A dark gray "saddle" is found across the top of their head. Both sexes have similar plumages (Burger and Gochfeld 2009). The forehead, lores and throat are white, while the occiput, cervix, loral and auricular regions are slate gray (Bent 1963). Most adult birds will show some pink in fresh plumage, although the extent of this pink is highly variable (McGraw and Hardy 2006). This pink flush has been linked to the carotenoid astaxanthin (McGraw and Hardy 2006). First year birds are similar to adults, but they are smaller with a paler breast. They also have a dark tail band (Godfrey 1966). This juvenal (first prebasic) molt is present during June and July (Burger and Gochfeld 2009). The primaries become whiter with each molt (Bent 1963). Franklin's Gulls follow a Complex Alternate molt strategy and typically have two complete molts each year (Burger and Gochfeld 2009).

Distribution

Rangewide

Franklin's Gulls breed from western Minnesota north to Manitoba and west to Alberta, and Oregon (Godfrey 1966, Burger and Gochfeld 2009; Fig. 6). They also bred in Iowa in 1940 (Jackson et al. 1996), in Nebraska in 1965 and 1966 (Sharpe et al. 2001), and in Kansas in 1993 (Thompson et al. 2011). Franklin's Gulls winter primarily along the Pacific Coast of South America, with the greatest numbers occurring from central Peru to central Chile (Godfrey 1966, Burger and Gochfeld 2009). Small numbers winter occasionally in southern California, the south-central U.S., from Guatemala to the Gulf of Panama, and the Galapagos Islands (Godfrey 1966, Burger and Gochfeld 2009).

Region 6

Colorado: This species is a migrant at low elevations and can be found in mountain parks. They are most common in eastern Colorado (Andrews and Righter 1992) and have recently been recorded breeding in Jackson County (Truan and Percival 1999). It is estimated that a total of 67 individuals breed in Colorado (Cavitt et al. 2014).

Kansas: Franklin's Gull is an abundant migrant in Kansas. Up to 500,000 individuals were noted at Cheney Reservoir on 24 October 1997 (Thompson et al. 2011). There is only one confirmed breeding record. During 1993, Franklin's Gulls bred at Cheyenne Bottoms West (Busby and Zimmerman 2001).

Montana: Franklin's Gulls are present in Montana from mid-April through mid-October (Montana Bird Distribution Committee 2012, Montana Field Guide 2014). This species breeds in only five known locations in the state, including Medicine Lake NWR (Sheridan and Roosevelt Counties), Bowdoin NWR (Phillips County), Benton Lake NWR (Cascade County), Freezeout Lake WMA

(Teton County), and Red Rock Lakes NWR (Beaverhead County; Montana Field Guide 2014). During the period 2009-2011, 23,960 individuals bred in Montana (Cavitt et al. 2014).

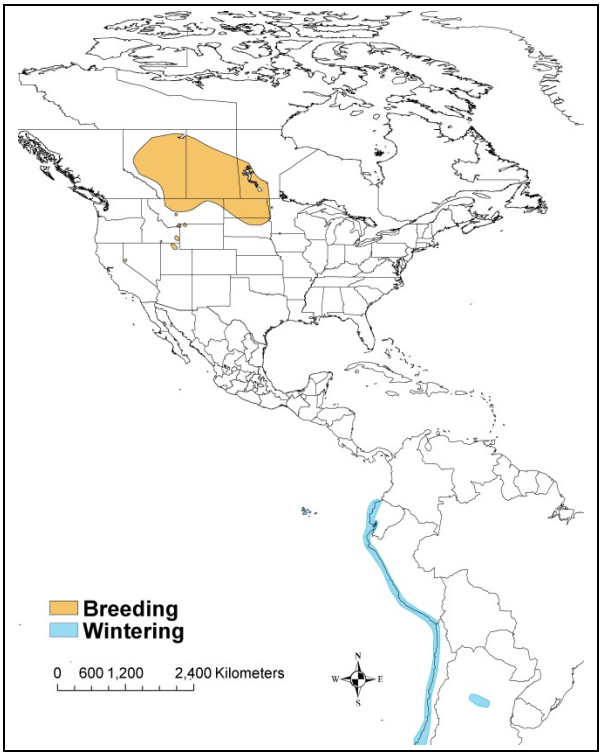

Figure 6. Franklin's Gulls breed primarily in northern prairies and winter along the Pacific Coast of South America. This map was created using data provided by BirdLife International and NatureServe (2012).

Nebraska: Franklin's Gulls are abundant migrants across the state (Sharpe et al. 2001). Breeding was confirmed in 1965 and 1966 (Sharpe et al. 2001) but this species has reportedly not bred in the state since.

North Dakota: Franklin's Gulls are abundant during migration and are locally common during the summer (Faanes and Stewart 1982). Franklin's Gull breed in Turtle Mountain Region, the Prairie Pothole Region and on the Coteau Slope. Some of the larger colonies are located in the Long Lake National Wildlife Refuge, the J. Clark Salyer National Wildlife Refuge, Dry Lake in Ramsey County, and in Kidder County (Stewart 1975).

South Dakota: This species is a common migrant and a locally common breeder in the northeastern corner of the state (Peterson 1995, Tallman et al. 2002). A colony at Sand Lake NWR in 1994 contained 155,325 nests (Peterson 1995). Away from the northeastern portion of the state they are uncommon to locally common (Tallman et al. 2002)

Utah: Franklin's Gulls are common summer residents in Utah (Utah Bird Record Committee 2014). Breeding colonies occur on the east side of the Great Salt Lake (Utah Conservation Data Center 2013). Currently, it is estimated that 10,133 individuals breed in Utah (Cavitt et al. 2014).

Wyoming: Franklin's Gulls are rare summer residents in Wyoming. They are thought to breed at Cokeville Meadows NWR (Lincoln County) but confirmation is lacking. (Faulkner 2010). Their numbers are highest during the spring and fall migrations (Faulkner 2010).

Biology

General

The primary foods of Franklin's Gulls include earthworms, grubs, and a variety of insects including midges [Chironomidae] and grasshoppers [Orthoptera] (Burger and Gochfeld 2009). They forage in dense flocks over wet pastures and will follow plows and disk harrows to feed on worms, arthropods and rodents. During the breeding season, they consume a greater quantity of seeds and other vegetable matter. On their wintering grounds Franklin's Gulls eat mice, fish, fish offal, crabs, snails and other invertebrates (Cikutovic and Guerra 1983, Burger and Gochfeld 2009).

Franklin's Gulls generally walk with a side-to-side body movement but will also hop. Individuals will fly to the front of the flock when foraging behind plows, resulting in a "leap-frog" pattern when foraging (Burger and Gochfeld 2009). This species is more aerial than larger gulls, and their flight is buoyant, strong and graceful. The adults are agile on the water and can

perform display while swimming. They also run quickly on beaches while feeding (Burger and Gochfeld 2009).

Colonies can be very noisy and Franklin's Gulls can be heard several kilometers away (Burger and Gochfeld 2009). The alarm call consists of a staccato *kuk-kuk-kuk-kuk* repeated several times and this call is given to when the colony is disturbed (Moynihan 1956). During courtship or chick-feeding a series of low, long-drawn out *keow* notes are emitted (Burger and Gochfeld 2009).

Kopachena (1987) noted that flock sizes varied depending upon both the time of day and the reliability of the food source. Kopachena (1987) suggests that flocking behavior is driven, at least in part, by increasing foraging efficiency. Kopachena and Evans (1990) also suggest that gulls may vocalize while riding thermals in order to recruit additional members into the flock.

This gull will respond to predators or intruders with a swoop-and-soar display and give long calls in addition to physically attacking the intruder. They will also use a distraction display when predators are near nests (Burger 1974).

Breeding

Franklin's Gulls nest in large colonies in prairie lakes and marshes (Godfrey 1966). They build their nests on a floating mass of dead plant material. Nests are 30-76 cm in diameter and are built 10-20 cm above the water level. Both sexes participate in the construction of the nest. The breeding season begins in early May and early June and ends by early July. This species is single-brooded (Baicich and Harrison 2005). Franklin's Gulls have been known to mate with Ring-billed Gulls (*Larus delawarensis*; Weseloh 1981).

Females usually lay three eggs. The eggs are subelliptical in shape and are very pale to medium greenish, olive or buff in color. The eggs are speckled, blotched, spotted, or scrawled with brown, olive, blackish-olive or black and the extent of these markings is variable. Both sexes incubate and incubation lasts for 24-25 days (Baicich and Harrison 2005). Hatchlings rely upon a hatchling muscle to help escape from the egg (Fisher 1962).

The size of the hatchlings is influenced by both egg contents and by photoperiod (Clark and Reed 2012). Nestlings are semi-precocial and downy. Both parents care for the young. Chicks can swim at three days and can fly at 28-33 days (Baicich and Harrison 2005). Conover and Hunt (1988) found that female chicks were more numerous than male chicks in museum collections, but males were more numerous than females among adults.

Wintering

Franklin's Gulls breed in freshwater habitats but winter along the coast. During the non-breeding season, the nasal gland becomes larger and more active (Burger and Gochfeld 1984). During winter, their diet shifts to mice, fish, offal, crabs, snails and invertebrates. On the Pacific Coast of Peru, they will feed on sandy beaches (Burger and Gochfeld 2009). During the non-breeding season, flocks of more than 1 million individuals have been reported in coastal Peru and at the Salt Plains National Wildlife Refuge, OK (Sutton 1967, Baumgartner and Baumgartner 1992).

Habitat

Breeding

Freshwater marshes are the preferred breeding habitat of Franklin's Gull (Burger and Gochfeld 2009). Nests are always over water and are built on floating mats, muskrat houses, or on floating debris (Weller and Spatcher 1965). Colonies can be found in cattails (*Typha* spp.), phragmites (*Phragmites communis*), or other types of emergent vegetation. Nesting occurs in areas of low vegetation density or in areas on the edge of dense clumps (Roberts 1900, Dumont

1940, Guay 1968, Burger 1974). The highest quality habitat consists of emergent vegetation with intermediate density and with patches of open water (Burger 1974).

Migration

During fall migration Franklin's Gulls are found in large flocks (Bent 1963). They migrate over the plains of Texas in large compact groups (Oberholser 1974). In Texas, they feed in flooded fields pastures, cropland, and prairies (Rappole and Blacklock 1985). They can also be found in estuaries, bays, mudflats, lagoons and lakes (Small 1974). Individuals occasionally migrate over high tundra in Colorado (Ryder 1978).

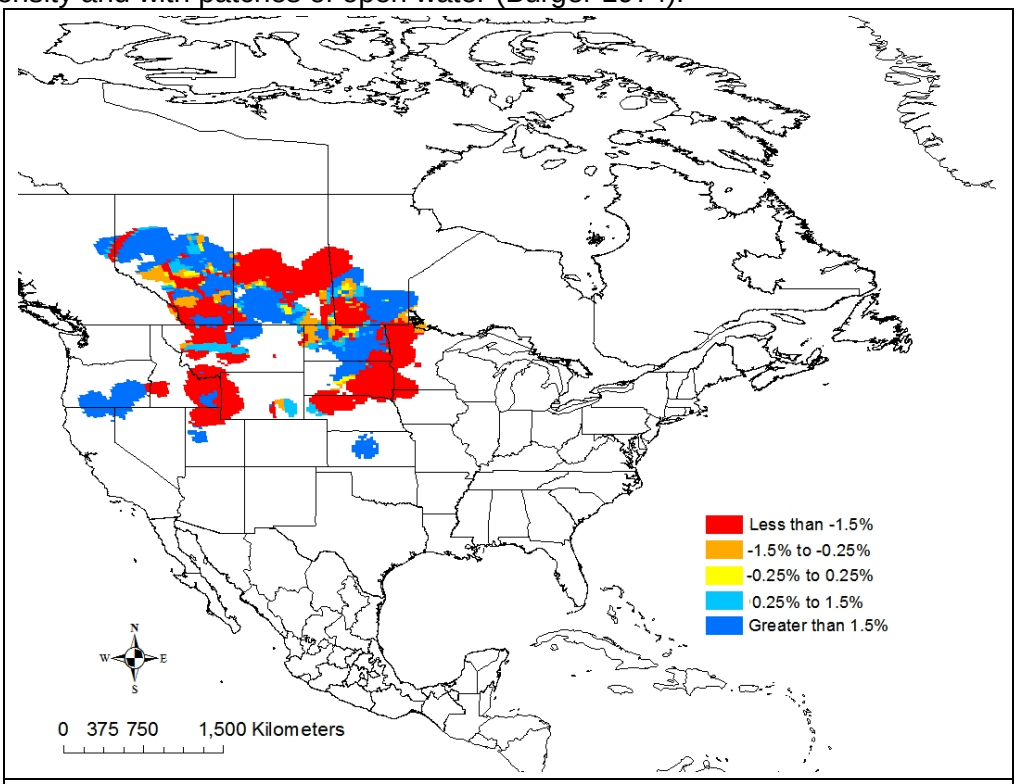

Figure 7. Map of percent change per year in the number of Franklin's Gulls detected during the Breeding Bird Survey (BBS) for the period 1966 – 2012 from Sauer et al. (2014). Populations fluctuate annually and no obvious spatial pattern is evident from this BBS data.

Winter

The wintering habitat consists of the coastal littoral zones, bays and estuaries. Franklin's Gulls can also be found offshore up to 50 km (Jaramillo and Burke 2003). They feed along the shore and rest on sandy beaches (Burger and Gochfeld 2009). This gull can be found in large concentrations in Peru near fishmeal plants (Plenge 1974).

Population Trends and Estimates

Colony sizes can vary substantially from year to year, so previous population estimates ranged from 315,000 to 990,000 individuals (Kushlan et al. 2002, Milko et al. 2003, Burger and Gochfeld 2009). More recently, Beyersbergen et al. (2008) estimates that there are 1,178,000 individuals in Canada and Cavitt et al. (2014) found 158,448 individuals across eight U.S. states. Burger and Gochfeld (2009) note that more than 1 million individuals were typically observed at Salt Plains NWR in Oklahoma during migration for the period 1942-1964 but less than 100,000 individuals were observed during 1975 to 1992. For the period 1966-2012, a significant annual decline of 4.0% was noted (Table 4). This trend was mirrored in Region 6, where the annual decline was 4.4% (Table 4; Fig. 7). However, Burger and Gochfeld (2009) note that the BBS may have difficult accurately tracking trends in this species as many colonies are not adequately surveyed by this methodology. The majority of this species winters along the Pacific Coast of South America and so is not adequately sampled by the Christmas Bird Counts.

Threats

Draining of marshes or drawdown management for duck-nesting habitat can lead to the degradation of nesting habitat (DuMont 1940, Littlefield and Thompson 1981). Habitat degradation can also result from the increased nitrogen and phosphorus load due to defecation (McColl and Burger 1976). Human activity can also negatively affect this species. At Tishimingo NWR in Oklahoma, disturbances by boats occurred an average of 0.71 times per hour (Schummer and Eddleman 2003). Human encroachment and pollution can also harm the freshwater marshes and coastal lagoons that are used during migration (Burger and Gochfield 2009).

Several studies have examined the extent of heavy metal contamination in this species (e.g., Greichus et al. 1978, Burger 1996, Burger and Gochfield 1997, 1999). Franklin's Gulls had greater insecticide and heavy metal concentrations in their tissues than American Coots (*Fulica americana*), European Starlings (*Sturnus vulgaris*) or American Crows (*Corvus brachyrhynchos*; Greichus et al. 1978). Heavy metal contamination varies across the landscape (Burger 1996). No difference in contamination was noted among the sexes, but age-related differences were observed (Burger and Gochfield 1996). Young Franklin's Gulls in northwestern Minnesota had elevated levels of arsenic, cadmium and manganese, while adult Franklin's Gulls had elevated levels of mercury and selenium (Burger and Gochfield 1997). Young birds also had up to 30 times as much chromium in their liver (Burger and Gochfield 1999). Overall, however, young Franklin's Gulls tend to have lower metal concentrations than adult birds (Burger and Gochfield 1999).

Effects of Climate Change

The sensitivity score for the Franklin's Gull on the Climate Change Sensitivity Database is "High" (Tomasevic 2010). Swanson and Palmer (2009) suggest that early migrants such as Franklin's Gulls are more likely to exhibit an earlier arrival date. Over the long-term, changes in precipitation rate caused by climate change could affect the hydrology of this species habitat, causing the amount of suitable wetland habitat to decrease (Ojima and Lackett 2002, Tomasevic 2010). Steen et al. (2014) suggests that Franklin's Gulls will likely exhibit severe (93-98%) declines due to projected wetland loss.

Effects of Energy Development

With the increase in the development of renewable resources, like wind power, this species could be vulnerable to offshore drilling and wind facilities on its wintering grounds. The location of these facilities could interfere with wintering populations in Peru (Burger et al. 2010) and elsewhere. The effects of energy development on the breeding grounds have not been investigated.

Management

Management should include increasing and maintaining large marshes with emergent vegetation for nesting habitat. Marsh water levels should be maintained at a constant water level if possible. Maintaining adequate water level is the main technique used today. The marsh management techniques now used by National Wildlife Refuges are benefiting gulls (Burger and Gochfeld 2009).

Conservation

Kushlan et al. (2002) summarizes the threats facing waterbirds. To aid in the conservation of this species, more research is needed to understand the adverse effects of hunting depredation as well as other types of predation on their wintering grounds. There also

needs to be improved population monitoring on an annual basis. Research on mate fidelity, age distribution, and life span would also help to better understand and conserve this species (Burger and Gochfeld 2009).

Completed and Ongoing Conservation Actions

There have been no continent-wide programs to offer protection to this species, other than those provided by the Migratory Bird Convention Act (Burger and Gochfeld 2009).

TABLE 3. Franklin's Gull status rangewide summarized by multiple listing agencies. IUCN is an abbreviation for "International Union for Conservation of Nature" and data comes from IUCN (2014), ABC is an abbreviation for "American Bird Conservancy" and data is from ABC (2012), and "PIF" is an abbreviation for "Partners in Flight" and data comes from PIF (2014). A hyphen (-) indicates a lack of data. For the ABC Conservation Assessment, "Secure" species have no immediate conservation issues, "Potential Concern" species have smaller populations or ranges or at higher rates of population declines, "Vulnerable" species deserve conservation attention, and "At Risk" species need more urgent conservation attention. The "Birds of Conservation Concern" row shows the Bird Conservation Regions (BCR) and US Fish & Wildlife Region where this species is considered to be of conservation concern (USFWS 2008).

IUCN	Least Concern
Federal listing	No
ABC Conservation Assessment	Potential Concern
Birds of Conservation Concern	-
PIF	-

TABLE 4. Franklin's Gull status summarized by Natural Heritage rankings, BBS trends for 1966-2012, BBS trends for 2000-2012, and multiple listing agencies. SGCN=Species of Greatest Conservation Need. A hyphen (-) = lack of data. For the natural heritage rankings, G = global and S = state, where S5 = secure (common, widespread, abundant, and lacking major threats or long-term concerns), S4 = apparently secure (uncommon but not rare, but with some cause for long-term concern, usually having more than 100 occurrences and 10,000 individuals), S3 = Vulnerable (rare; typically having 21-100 occurrences, or 3,000-10,000 individuals), S2 = Imperiled (typically having 6-20 occurrences, or 1,000-3,000 individuals), and S1 = Critically imperiled (typically having five or fewer occurrences, or 1,000 or fewer individuals). Natural Heritage rankings are only for breeding populations. For the BBS trends, data with an important deficiency are labeled as "Insufficient data". The BBS trends are annual changes. Numbers in parentheses are 95% confidence intervals.

	Natural Heritage Ranking	BBS Trend (1966 – 2012)	BBS Trend (2000 – 2012)	State Listing	SGCN
Rangewide	G4	-4.0% (-6.8, -1.9%)	-0.1% (-5.3, 6.1%)	-	-
Region 6	-	-4.4% (-9.0, -0.4%)	1.1% (-6.1, 17.2%)	-	-
Montana	S3B	Insufficient data	Insufficient data	Species of Concern	Tier II
North Dakota	SNRB	-2.0% (-5.9, 1.3%)	-3.3% (-19.7, 3.5%)	-	Level I
South Dakota	S5B	Insufficient data	Insufficient data	-	-
Wyoming	SHB	Insufficient data	Insufficient data	-	Tier II
Colorado	S4, S5N	-	-	-	-
Utah	-	Insufficient data	Insufficient data	-	-
Nebraska	S4	-	-	-	-
Kansas	SNA	-	-	-	-

Black Tern (*Chlidonias niger*)

Figure 8. Unlike most terns which feed primarily on fish, Black Terns feed largely upon insects during the breeding season. Photo by Wild Wonders of Europe / Varesvuo / Nature Picture Library / Universal Images Group.

Summary

- Black Terns are small terns with a distinctive black head and underparts during the breeding season. During the non-breeding season, they become predominantly white below with a white cheek and a pale nape. They feed primarily on insects and small freshwater fish.
- Black Terns breed in North America as well as in Europe and Asia. In North America, the breeding range extends from Nova Scotia west to California and north to the Northwest Territories and the Yukon. They are uncommon along the southern and northeastern edges of their breeding range. Black Terns winter along the coasts of Central America and northern South America.
- There are an estimated 500,000-1,000,000 Black Terns in Europe and Asia with an estimated 100,000-500,000 pairs in North America. Within Region 6, Black Terns are listed as a Level I / Tier I species (i.e., a species in greatest conservation need) in Montana, North Dakota, South Dakota, and Kansas. They are listed as a Level II / Tier II species (i.e.,a species in need of conservation) in Wyoming and Nebraska.
- Only 1.8 ± 0.4 Black Terns are detected annually on Christmas Bird Counts in the US and Mexico and so it is not possible to reliably estimate trends on the wintering grounds. There is insufficient Breeding Bird Survey data to determine if rangewide declines are occurring. However, a significant decline of 3.1% was noted in Region 6 from 1966-2012.

Legal Status

The Migratory Bird Treaty Act (MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA protects any migratory bird under 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Status rangewide is summarized by Tables 5 and 6.

Description

Black Terns are small terns that are 23-26 cm in length and weigh 50-60 g (Fig. 8). Both sexes are similar with differences in size and color intensity noted in the Old World subspecies *C. n. niger* (Heath et al. 2009, Pyle 2008). Adult Black Terns have two complete molts (Heath et al. 2009). The prenuptial molt occurs in the early spring and the postnuptial in July, August and September. In winter, the forehead, a nuchal collar and underparts are white. The auriculars and a small orbital space are black. The occiput and crown are mottled with gray and black. The mantle, wings and tail are lighter gray in the winter than in the spring. During August and September, juveniles have brown upper parts and the under parts are brownish and dusky, and have sides that are drab. The feathers of the back are broadly margined with “clove brown” and have whitish tips. The juvenile forehead is dirty white and the crown is typically black. The auriculars and eye ring is black. The first winter plumage is similar to adult plumage, but can be distinguished from adults by their smaller bill. This juvenile plumage is kept until June and July (Bent 1921).

Distribution

Rangewide

Black Terns breed in the Northern Hemisphere in both the New and Old World (Godfrey 1966). Black Terns breed from southern Sweden south to Spain and east to Mongolia. These birds primarily winter along the Atlantic coast of Africa, from Western Sahara south to South Africa (Snow and Perrins 1998). In North America, Black Terns breed from Nova Scotia west to California and north to the Northwest Territories of Canada (Ridgely and Gwynne 1989, Heath et al. 2009; Figure 9). Black Terns winter on the marine coasts of Central America and northern South America (Heath et al. 2009, Ridgely and Gwynne 1989). The exact winter distribution of this species is still not well understood as birds are irregular through much of their winter range (Ridgely and Gwynne 1989, Heath et al. 2009).

Region 6

Colorado: Black Terns are common migrants in eastern Colorado and uncommon in western Colorado. They are a very uncommon and local summer resident on the eastern plains as well as mountain parks (Andrews and Righter 1992). During the Colorado Breeding Bird Atlas, breeding was confirmed only at the San Luis Lake SWA and the Alamosa and Arapaho NWR (Kingery 1998).

Kansas: Black Terns are common migrants through Kansas but are rare breeders. Black Terns were first documented breeding in the Cheyenne Bottom Wildlife Area in central Kansas in 1961 and have been sporadic breeders there since 1968 (Busby and Zimmerman 2001, Thomson et al. 2011). They also bred at Cadillac Lake in Sedgewick County in 1957 (Janzen 2007).

Montana: Black Terns arrive in May (rarely April) and depart by September. They breed throughout the state in suitable habitat, although the largest numbers of confirmed breeding

locations are found in the northern half of the state (Montana Bird Distribution Committee 2012, Montana Field Guide 2014).

Nebraska: Black Terns are common migrants throughout the state, although breeding is restricted to northern and western Nebraska (Sharpe et al. 2001). During the Nebraska Breeding Bird Atlas of 1984-1989, breeding was only confirmed in the Sandhills although it was suggested that birds may also occasionally breed in the Rainwater Basin region in years with high precipitation and when the basins are filled (Molhoff 2001).

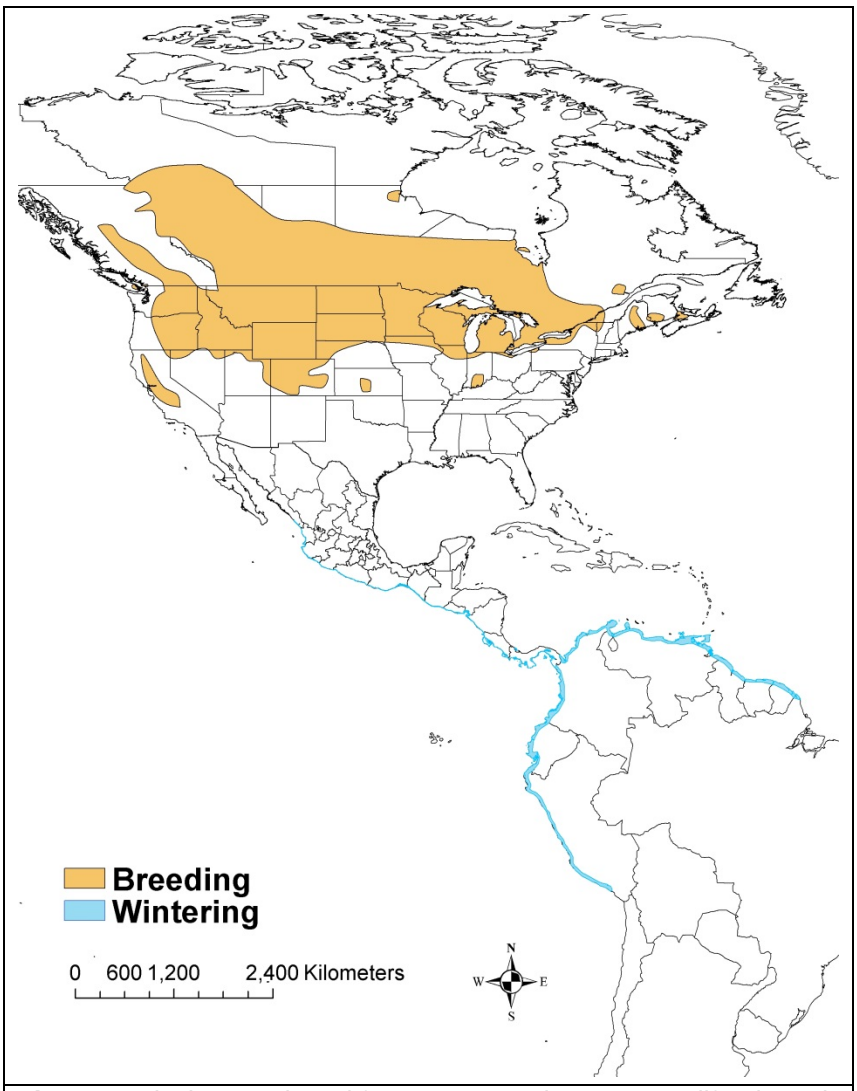

Figure 9. Black Terns breed from Nova Scotia west to California and north to the Northwest Territories of Canada. The winter along coastal Central and northern South America, although their winter presence at most sites is irregular. This map was created using data provided by BirdLife International and NatureServe (2012).

North Dakota: Black Terns are common during spring and summer and are abundant during the fall (Faanes and Stewart 1982). They are especially common in the Prairie Pothole Region and the Turtle Mountains. Black Terns are uncommon and local in the Agassiz Lake Plain Region, on the Coteau Slope, and in the northeastern portion of the Little Missouri Slope. They are considered rare and local on the rest of the Little Missouri Slope (Stewart 1975).

South Dakota: In South Dakota, Black Terns are considered abundant migrants and common summer residents in the eastern parts of the state. In the west, Black Terns are uncommon (South Dakota Ornithologists' Union 1991, Tallman et al 2002).

Utah: Black Terns are classified as an uncommon summer resident and an uncommon transient (Utah Bird Record Committee 2014). They breed primarily around the Great Salt Lake and in Millard, Utah, Tooele, and Box Elder Counties (Utah Conservation Data Center 2013).

Wyoming: Migrating Black Terns occur in low-elevation ponds, lakes, and reservoirs statewide in Wyoming. They are rare summer breeders. Breeding occurs in the Laramie Plains (Albany

County), and Cokeville NWR (Lincoln County). Breeding is also thought to occur at Ocean's Lake (Fremont County) and Yant's Puddle (Natrona County; Faulkner 2010).

Biology

General

During the breeding season, Black Terns mainly feed on insects and fish (Heath et al. 2009). When feeding, Black Terns hover, often in flocks, before swooping to the surface and dipping bill in the water or picking insects from the vegetation (Heath et al. 2009). They sometimes hunt over water from a perch (Welham and Ydenberg 1993, Heath et al. 2009). The preferred insects during the breeding season are damselflies and dragonflies (both Odonata). Other insects that Black Terns consume during this time include mayflies (Ephemeroptera), caddisflies (Trichoptera), moths (Lepidoptera), crickets, locusts, beetles (Coleoptera), spiders (Araneida), grubs and larvae (Bent 1921, Cuthbert 1954, Goodwin 1960, Dunn 1979, Clapp et al. 1983, Mosher 1986, Heath et al. 2009). Fish are also consumed in summer when available (Heath et al. 2009). During migration, fish and insects are consumed in varying proportions depending on availability (Heath et al. 2009, Clapp et al. 1983). The winter diet of Black Terns mainly consists of small marine fish (Heath et al. 2009).

Chicks begin peeping within the egg up to 15 hours before hatching (Goodwin 1960, Heath et al. 2009). Chicks are able to produce the *Kyew* call on their first flight, but this call only sounds fully mature after a few months (Heath et al. 2009). The Black Tern contact call is a *kip* or *kik* and is heard from flocks and foraging birds (Cramp 1985, Stiles and Skutch 1989, Heath et al. 2009). The agonistic call of the Black Terns includes a high-pitched *kik* or *keek*. The intensity of the call increases as danger moves closer (Heath et al. 2009, Cramp 1985). Feeding flocks will sometimes make a scratchy *keeurrr* call (Stiles and Skutch 1989).

Black Terns are agile flyers. Flight is considered less bounding than other terns (Stiles and Skutch 1989). Foraging is done over land and water at a low altitude and with slow wingbeats (Bent 1921, Heath et al. 2009). Having a stronger downbeat than recovery makes Black Terns in flight appear more erratic than other terns (Heath et al. 2009).

Breeding

Black Terns are monogamous and pair formation begins prior to the arrival at nesting areas (Mosher 1986, Heath et al. 2009). Most birds reach breeding areas in early May (Heath et al. 2009). Both sexes participate in incubation. Usually they only have a single brood per season, though some probable renesting has been reported (Johnsgard 1979). Renesting birds are probably birds that lost the first nest and are attempting to raise another brood before the end of the breeding season (Bent 1921). Breeding colonies for Black Terns range from 2-80 individuals (Cavitt et al. 2014).

Black Terns nest in shallow freshwater habitats (Heath et al. 2009). The nests are flimsy and often float. Nests are vulnerable to damage from high winds and changing water levels (Heath et al. 2009). Nesting is semicolonial and the nests can be found in water that is 0.3-0.9 m deep. The nesting substrate tends to be smaller and lower than Forster's Tern (*Sterna forsteri*) nests (Johnsgard 1979). Nests are constructed in depressions in the nest substrate lined with marsh vegetation (Semenchuk 1992). Nests from previous years are not reused (Johnsgard 1979), but birds will nest in same area year to year unless emergent vegetation becomes too dense or water levels change dramatically (Semenchuk 1992).

The shape of Black Tern egg is oval to long oval. Eggs are variable in color, from light buff to dark olive (Heath et al. 2009). Typically, 2-4 eggs are laid (Johnsgard 1979). Eggs have 50% more pores than would be expected given their size, but constantly waterlogged nests do not seem to affect success (Davis and Ackerman 1985, Firstencel 1987, Heath et al. 2009). The incubation time for Black Terns is 21-24 days (Johnsgard 1979). Both adults tend to the young.

Nestlings are able to move around the nest but remain in the nest for two weeks. They start to fly at three weeks and fully fledge at four weeks (Baicich and Harrison 2005).

Wintering

During the winter, Black Terns primary feed offshore on schools of small fish. While offshore, this species is found alone or in loose flocks. They feed by swooping and diving for fish, and rarely dive after prey (Stiles and Skutch 1989).

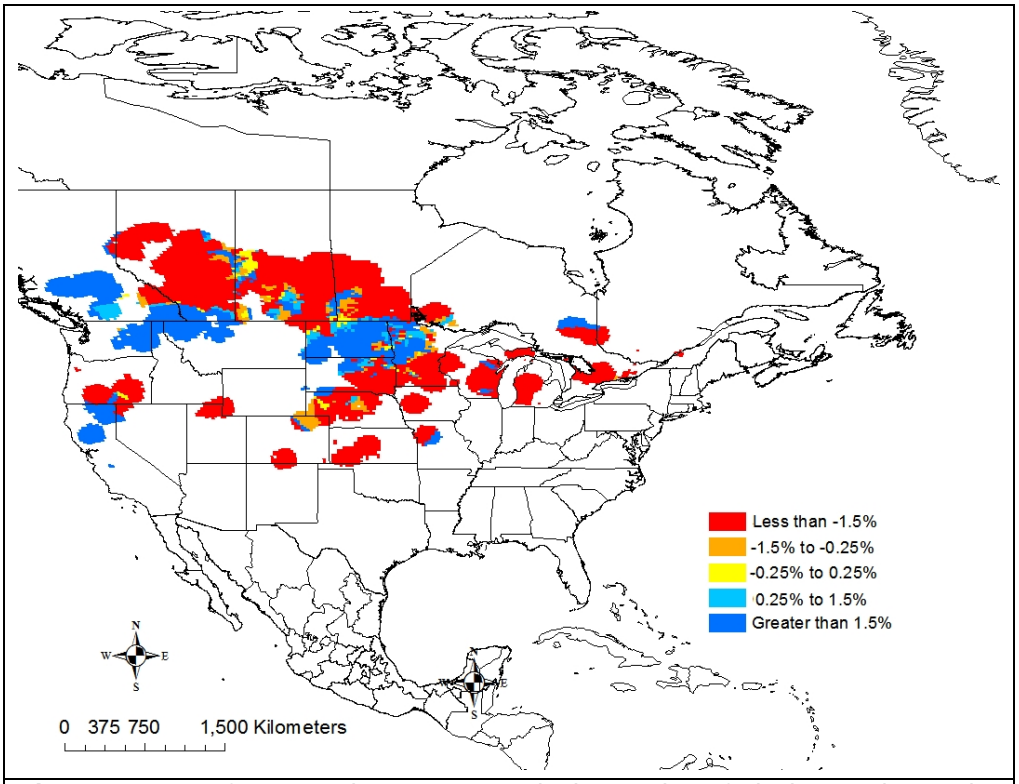

Figure 10. Map of percent change per year in the number of Black Tern detected during the Breeding Bird Survey (BBS) for the period 1966-2012 from Sauer et al. (2014). Substantial declines occurred at the southern, eastern, and northern edges of the species range. The increase in numbers of Black Terns detected in North Dakota and northwestern Minnesota is not statistically significant.

Habitat

Breeding

The breeding habitat of Black Terns consists of wetlands with a mixture of open water and emergent vegetation (Busby and Zimmerman 2001). Shallow wetlands are preferred for nesting (Heath et al. 2009, Greenberg 1972). Examples of nesting sites include prairie sloughs, the margins of lakes, natural ponds, shallow river impoundments and large stock ponds (Stewart 1975, Stewart and Kantrud 1974, Heath et al. 2009). These breeding habitats are typically adjacent to large areas of open water (Stewart 1975, Semenchuk 1992). This species prefers wetland habitats that have little or no woody vegetation present (Naugle et al. 1999).

Migration

During migration, Black Terns forage over plowed fields and coastal wetlands (Heath et al. 2009). Black Terns in the U.S. also frequent freshwater lakes, rivers, and interior wetlands (Heath et al. 2009, James and Neal 1986, Campbell et al. 1990, Small 1994). When returning to breeding grounds, this species will return to land and feed near salt ponds, flooded fields and marshes (Stiles and Skutch 1989). These terns will also forage for insects over grasslands and alfalfa fields (Thompson et al 2011). They can also be seen on sandbars, mudflats and dikes (Stiles and Skutch 1989).

Winter

In the winter, Black Tern habitat shifts to primarily marine and marine coastal areas. They become marine birds during the winter and nonbreeding times of the year (Heath et al. 2009). During winter, birds can be found within 30 km of the coast (Clapp et al. 1983, Heath et

al. 2009). Black Terns can be found feeding over salt ponds, flooded fields and marshes on wintering grounds (Stiles and Skutch 1989).

Population Trends and Estimates

There are an estimated 500,000-1,000,000 Black Terns in Europe, Asia, and Africa (Wetlands International 2014) and an estimated 100,000-500,000 pairs in North America (Kushlan et al. 2002). There is insufficient data to determine population trends of Black Terns rangewide from BBS data. However, a significant decline of 3.1% annually was noted in Region 6, with a decline of 4.8% in Nebraska (Table 6, Fig. 10). Peterjohn and Sauer (1997) suggest that Black Tern declines were most pronounced prior to 1980. However, BBS data show that Black Terns declined at a rate of 5.6% in Region 6 during the period 2000-2012. A decline of -0.0002% per year was noted on the number of Black Terns detected on Christmas Bird Counts in the U.S. and Mexico during the period 1966-2012 ($F_{1,45}$ = 13.4, R^2 = 0.21, p = 0.0007; Figure 11). However, only 1.8 ± 0.4 Black Terns are detected annually, and so the observed trend is not biologically meaningful.

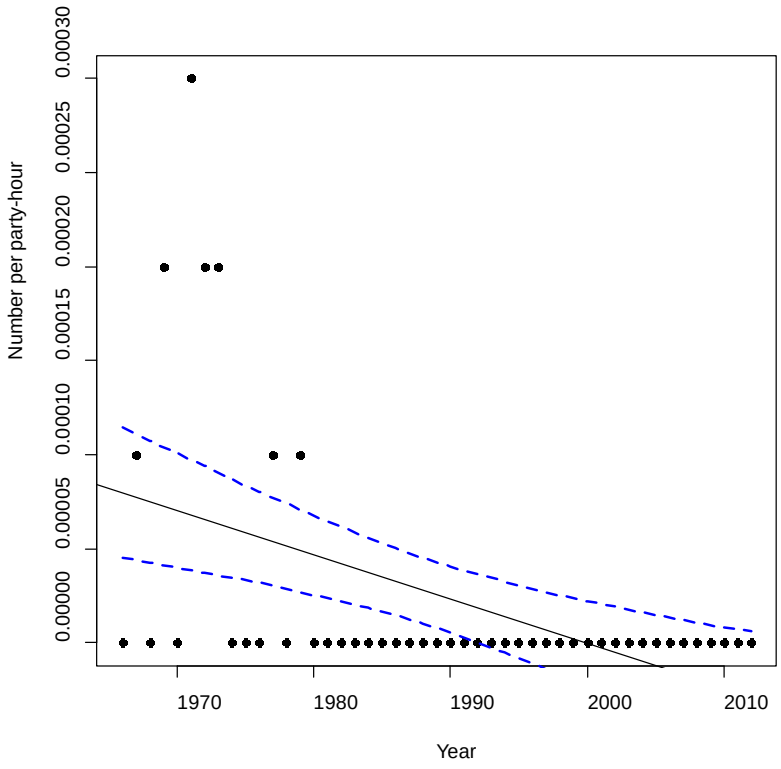

Figure 11. The number of Black Terns detected per party-hour during CBCs in the US and Mexico for the period for the period 1966-2012 changed at a rate of -0.0002% per year. Dashed lines indicate 95% confidence intervals. This figure was created using data from the National Audubon Society (2014).

Threats

Wetland Loss

The decline of suitable wetlands on the breeding grounds and migration routes reduced Black Tern populations (Heath et al. 2009).

Pesticides

The use of pesticides may be a threat to Black Tern populations. Pesticides reduce insect populations and could lead to a reduction of available food for Black Terns (Kingery 1998). However, there is no direct evidence of Black Tern mortality due to toxic chemicals (Heath et al. 2009).

Overfishing

Black Terns may also be threatened by overfishing. Overfishing off the Pacific Coast of Central America and northern South America has the potential to devastate Black Tern populations by reducing food availability on their wintering grounds (Kingery 1998).

Effects of Climate Change

The sensitivity score for the Black Tern on the Climate Change Sensitivity Database is "Medium" (Tomasevic 2010). Forcey et al. (2014) found that Black Tern occupancy was driven both by wetland presence as well as by the previous year's precipitation. Climate change is expected to reduce wetland extent in Region 6 which could have a negative impact on this species (Ojima and Lackett 2002, Tomasevic 2010). Steen et al. (2014) estimated that Black Terns could experience a 66% decline in the amount of suitable habitat due to climate change.

Effects of Energy Development

There has been little research to show that energy development has a direct negative effect on Black Terns. Wind turbines have been shown to not substantially reduce Black Tern occurrence near wind energy sites. Indeed, wetlands in areas of wind energy development have conservation value for Black Terns (Niemuth et al. 2013).

Management

Cattail management benefits Black Tern populations. The numbers of Black Terns are positively correlated with increasing open water and dead cattails (Linz and Blixt 1997). Increasing the amount of dead cattail mats, live emergent vegetation, and open water also increases the Black Tern populations (Linz et al. 1994). Decreasing the amount of woody vegetation that is present in a wetland will increase the suitable habitat for these terns (Naugle et al. 1999). Floating nest platforms are an effective management tool, because they enhance nesting habitat for Black Terns (Shealer et al. 2006).

Conservation

The threats facing waterbirds are summarized by Kushlan et al. (2002). Conservation of wetlands and wet grassland habitat will benefit Black Tern populations. A broad-scale conservation approach will be necessary for management of this species. In areas that have had significant loss of wetlands, wetland restoration along other habitat conservation will help this species. Effective long-term monitoring programs will also be needed to quantify how varying water levels, number of wetlands, and changing landscape patterns influence Black Tern habitat use (Naugle 2004).

The demographic information that is needed to aid in the conservation of Black Terns is estimates of adult and chick survival. Increasing knowledge of Black Tern ecology will require a better understanding of Black Terns on their wintering grounds to help determine if issues on the breeding grounds are solely responsible for population declines (Naugle 2004).

Completed and Ongoing Conservation Actions

Nesting platforms have been constructed in Wisconsin. These increase nest survival and hatching rates (Shealer et al. 2006). In addition, removing cattails increases Black Tern numbers (Linz and Blixt 1997).

TABLE 5. Black Tern status rangewide summarized by multiple listing agencies. IUCN is an abbreviation for "International Union for Conservation of Nature" and data comes from IUCN (2014), ABC is an abbreviation for "American Bird Conservancy" and data is from ABC (2012), and "PIF" is an abbreviation for "Partners in Flight" and data comes from PIF (2014). A hyphen (-) indicates a lack of data. For the ABC Conservation Assessment, "Secure" species have no immediate conservation issues, "Potential Concern" species have smaller populations or ranges or at higher rates of population declines, "Vulnerable" species deserve conservation attention, and "At Risk" species need more urgent conservation attention. The "Birds of Conservation Concern" row shows the Bird Conservation Regions (BCR) and US Fish & Wildlife Region where this species is considered to be of conservation concern (USFWS 2008).

IUCN	Least Concern
Federal listing	No
ABC Conservation Assessment	Potential Concern
Birds of Conservation Concern	BCR 11, BCR 12, BCR 13, BCR 22, BCR 23, USFWS Region 3
PIF	-

TABLE 6. Black Tern status summarized by Natural Heritage rankings, BBS trends for 1966 – 2012, BBS trends for 2000 – 2012, and multiple listing agencies. SGCN=Species of Greatest Conservation Need. A hyphen (-) = lack of data. For the natural heritage rankings, G = global and S = state, where S5 = secure (common, widespread, abundant, and lacking major threats or long-term concerns), S4 = apparently secure (uncommon but not rare, but with some cause for long-term concern, usually having more than 100 occurrences and 10,000 individuals), S3 = Vulnerable (rare; typically having 21 – 100 occurrences, or 3,000 – 10,000 individuals), S2 = Imperiled (typically having 6 – 20 occurrences, or 1,000 – 3,000 individuals), and S1 = Critically imperiled (typically having five or fewer occurrences, or 1,000 or fewer individuals). Natural Heritage rankings are only for breeding populations. For the BBS trends, data with an important deficiency are labeled as "Insufficient data". The BBS trends are annual changes. Numbers in parentheses are 95% confidence intervals.

	Natural Heritage Ranking	BBS Trend (1966 – 2012)	BBS Trend (2000 – 2012)	State Listing	SGCN
Rangewide	G4	Insufficient data	Insufficient data	-	-
Region 6	-	-3.1% (-5.2, -1.2%)	-5.6% (-10.5, -0.6%)	-	-
Montana	S3B	Insufficient data	Insufficient data	Species of Concern	Tier I
North Dakota	SNRB	-2.6% (-5.5, 0.2%)	0.7% (-8.1, 9.9%)	-	Level I
South Dakota	S3B	-5.6% (-9.4, -1.8%)	-5.8% (-19.3, 9.4%)	-	Species of Greatest Conservation Need
Wyoming	S1	-	-	-	Tier II
Colorado	S2B	-	-	-	-
Utah	SHB	-	-	-	-
Nebraska	S3	-4.8% (-8.9, -0.3%)	-5.0% (-11.7, 0.9%)	-	Tier II
Kansas	S1B	-	-	Species In Need of Conservation	Tier I

Black-billed Cuckoo (*Coccyzus erythropthalmus*)

Figure 12. Populations of Black-billed Cuckoos fluctuate in response to hairy and spiny caterpillar numbers. Black-billed Cuckoo photo by Don Johnston / All Canada Photos / Universal Images Group.

Summary

- Black-billed Cuckoos are slender, long-tailed birds that are brown above and white below. They are similar to Yellow-billed Cuckoos, but have a black bill, a red eyering and relatively small pale spots on the underside of their tail. The number of birds breeding in an area is dependent upon the density and abundance of hairy and spiny caterpillars.
- Black-billed Cuckoos breed from Nova Scotia through the Appalachians to western North Carolina, and west to Wyoming and Alberta. This species winters in South America, from Columbia east to Venezuela and south to Peru.
- There are an estimated 870,000 individuals. They are considered to be a Level I / Tier I species in both North Dakota and Kansas and are a Tier II species in Montana.
- Breeding Bird Survey data suggests that Black-billed Cuckoos are declining rangewide at a rate of 2% per year. Within USFWS Region 6, they are declining at a rate of 4.8% per year, and significant declines have been observed in North Dakota, Nebraska and Kansas.

Legal Status

The Migratory Bird Treaty Act (MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA protects any migratory bird under 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Status rangewide is summarized by Tables 7 and 8.

Description

The Black-billed Cuckoo is a slender, long-tailed bird (Fig. 12). It measures 28-31 cm in length and has a mass of 45-55 g. The upper parts of this bird are grayish brown to slightly olive in color. The underparts are dull white. The tail is 15 cm long and is grayish brown and is slightly darker below, with relatively small pale spots. This species has a moderately long curved bill, averaging 24 mm in length. The upper mandible is black, and the lower mandible is plumbeous with a dark tip. The orbital ring is bright red in breeding adults, and is yellowish on wintering birds. This species is sexually and seasonally monomorphic. The juveniles resemble adults, but are more brownish and have yellowish orbital rings. These birds can be confused with Yellow-billed Cuckoos (*Coccyzus americanus*; Hughes 2001).

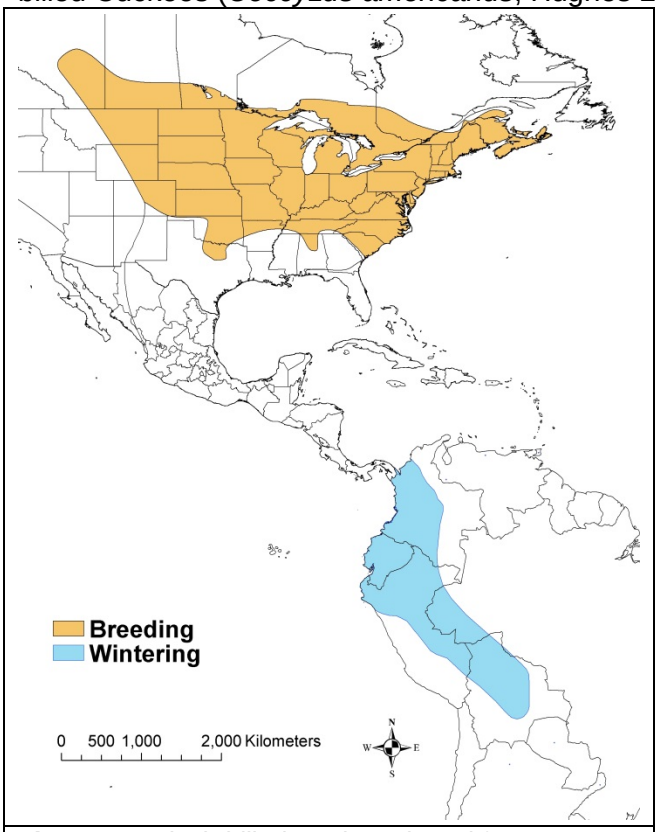

Figure 13. Black-billed Cuckoos breed from Nova Scotia west to Alberta and south to northeastern Oklahoma and western North Carolina. They have bred south of this range occasionally. They winter in South America, but the winter distribution is not well known. The greatest numbers appear to winter in central Peru. This map was created using data provided by BirdLife International and NatureServe (2012).

Distribution

Rangewide

The breeding range of the Black-billed Cuckoo extends from Nova Scotia west to Alberta, and south to northeastern Oklahoma and western North Carolina (Fig. 13). They have occasionally bred south of this range (Hughes 2001). They winter in northwest South America, with the largest numbers apparently wintering in central Peru. However, the winter distribution of this species is not well known (Hughes 2001).

Region 6

Colorado: Black-billed Cuckoos are rare migrants and summer residents in the eastern plains of Colorado (Andrews and Righter 1992). The three observations during the Breeding Bird Atlas were found in cottonwoods and were restricted to northeastern Colorado. The only confirmed nest during the Breeding Bird Atlas was on Tamarack SWA. (Kingery 1998).

Kansas: This species is classified as an uncommon transient and a summer resident. It is found primarily in the east and north central parts of the state (Thomas et al. 2011). The six confirmed nesting pairs during the Kansas Breeding Bird Atlas were in the eastern two-thirds of the state (Busby and Zimmerman 2001).

Montana: Black-billed Cuckoos typically arrive in June and leave by September. They breed east of the Rocky Mountains but few nests have been documented in Montana (Montana Bird Distribution Committee 2012, Montana Field Guide 2014).

Nebraska: Black-billed Cuckoos are found throughout the state. In the spring and fall, they are considered to be common migrants. They are less common in the western portions of the state. They are also considered to be uncommon breeders throughout the state (Molhoff 2001, Sharpe et al. 2001).

North Dakota: Black-billed Cuckoos are fairly common during spring and summer and are uncommon during the fall (Faanes and Stewart 1982). This species is fairly common in western Pembina County, in the Pembina Hills, the Turtle Mountains, near Devil's Lake. It is also found along the streams in the Agassiz Lake plain, near the Sheyenne River, James River, and Mouse River. Black-billed Cuckoos are uncommon elsewhere throughout the state (Stewart 1975).

South Dakota: Black-billed Cuckoos are fairly common and widespread throughout South Dakota. They can be found in both upland and lowland woodlands (Peterson 1995, Tallman et al. 2001).

Utah: Black-billed Cuckoos are accidental in Utah (Utah Bird Record Committee 2014).

Wyoming: In Wyoming, Black-billed Cuckoos are rare summer residents, with most reports during June. Multiple reports have come from Sheridan, Big Horn, Natrona, and Teton Counties. However, records peaked during the 1980s, declined during the 1990s, and continued to decline through 2005 (Faulkner 2010).

Biology

General

The Black-billed Cuckoo is more secretive and stealthy than the Yellow-billed Cuckoo (Busby and Zimmerman 2001). In addition to the difference in bill color and tail coloration, this species can be differentiated from the Yellow-billed Cuckoo by its call. Notes in the call are grouped into series of three and the '*kow-kow-kow, kow-kow-kow'* call does not slow down towards the end (Thomson et al. 2011).

The primary prey species of the Black-billed Cuckoo is hairy and spiny caterpillars (Squires 1930, Cadman et al. 2007, Thomson et al. 2011), although Agro (1994) notes that Black-billed Cuckoos will also consume grasshoppers. Hairy and spiny caterpillars are often ignored by other bird species, and the Black-billed Cuckoo is thus an important consumer of these species (Thomson et al. 2011). Black-billed Cuckoo populations are cyclic in response to cyclic variations in caterpillar populations (Sharpe et al. 2001), including gypsy moths (*Lymantria dispar*; Gale et al. 2001). Koenig and Liebhold (2013) also suggest that populations may respond to periodical cicada populations. Black-billed Cuckoo distribution depends upon the availability of their primary prey. This species is occasionally a nest parasite (Cadman et al. 2007), although parasitism is more common when food resources are abundant (Hughes 2001).

Breeding

Black-billed Cuckoos are found in the brushy margins and openings in woodlands (Stewart 1975). The breeding season starts in early to mid-May (Baicich and Harrison 2005). Black-billed Cuckoos nest most frequently in early successional habitats. The nests are placed low to the ground, often in a low bush or tree (Cadman et al. 2007, Godfrey 1966). The nests

are made from twigs and are fragile, but are sturdier than Yellow-billed Cuckoo nests (Godfrey 1966, Baicich and Harrison 2005).

Eggs are usually laid every second day, but intervals can vary (Hughes 2001). This species has a clutch size of 2-3 eggs and the incubation time is 10-11 days (Hughes 2001, Cadman et al. 2007). Black-billed Cuckoo eggs are elliptical in shape (Hughes 2001). They are 24.5-32.3 mm in length and weigh 6.3 g on average. The eggs are greenish blue and unmarked. The shell texture is smooth to slightly rough and they are not glossy (Hughes 2001).

Nolan and Thompson (1975) note that both Yellow-billed Cuckoos and Black-billed Cuckoo engage in brood parasitism when food is unusually abundant. Sealy (2003) also reports that Black-billed Cuckoos will engage in conspecific nest parasitism. Hughes (1997) compiled reports of both species parasitizing each other as well as other non-cuckoo passerines and suggested that the blue color of the eggs evolved due to host discrimination. However, Lorenzana and Sealy (2002) failed to find support for this hypothesis when they tested white and blue cuckoo eggs in American Robin (*Turdus migratorius*) and Gray Catbird (*Dumetella carolinensis*) nests. In order to help elucidate the role of host discrimination, Stewart et al. (2011) found that nearly two-thirds of Yellow Warblers (*Setophaga petechia*) will accept cuckoo-sized eggs into the nest, suggesting that these birds do not discriminate against larger eggs.

Both adults will incubate the eggs beginning with the first egg (Spencer 1943, Baicich and Harrison 2005). The eggs generally hatch in the early morning. The nestling will remain in the half shell until it is entirely dry and will give low calls after emerging. (Spencer 1943). Both adults tend to nestlings and bring insects carried in its throat pouch. Nestlings' eyes open at 2-3 days, and they begin preening at six days. Young leave the nest and perch at seven to nine days. They can fly at 21-24 days (Baicich and Harrison 2005).

Wintering

Very little has been published on the winter ecology of the Black-billed Cuckoo. This species is typically solitary, silent, and secretive on its wintering range and is most frequently encountered as it flies low through the trees (Schauensee and Phelps 1978, Hughes 2001).

Habitat

Breeding

Black-billed Cuckoos nest in shrubby old fields, hedgerows, riparian thickets, woodlands and forest edges (Cadman et al. 2007). This species prefers the openings and brushy margins found in these wooded habitats (Stewart 1975). These cuckoos prefer habitats that have a variety of different trees, bushes and vines that can be used for nesting and generally prefers areas with more trees than the Yellow-billed Cuckoo (Johnsgard 1979, Molhoff 2001). They can also be found in shelterbelts and partially wooded landscapes of towns, suburbs and farmsteads (Stewart 1975). Black-billed Cuckoo nests are typically close to the ground (Cadman et al. 2007).

Migration

This species can be found in many different habitats during migration. In Panama they prefer open woodlands, edges, and open areas with scattered bushes and trees (Ridgely and Gwynne 1989). In Florida, they are found in wooded areas and dense thickets (Stevenson and Anderson 1994).

Winter

In winter, this species can be found in rain forests, second growth forests, semi-open woodlands and plantations. They are typically found at an altitude of 350-1100 m (Schauensee and Phelps 1978).

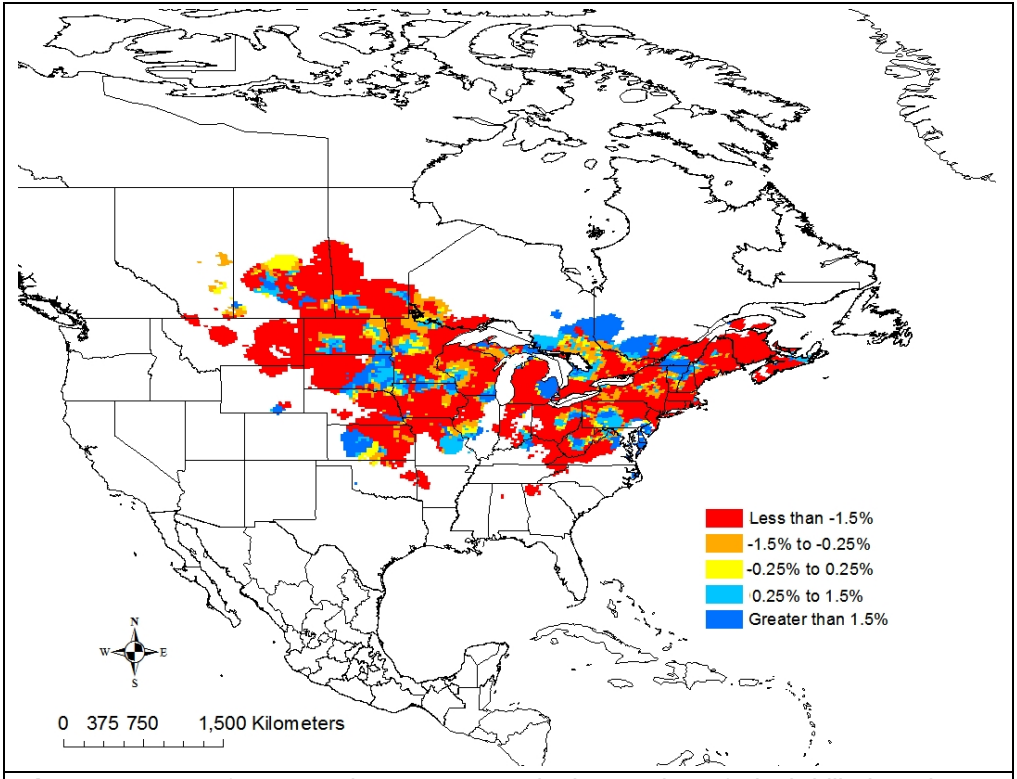

Figure 14. Map of percent change per year in the number of Black-billed Cuckoos detected during the Breeding Bird Survey (BBS) for the period 1966 – 2012 from Sauer et al. (2014). Black-billed Cuckoos are generally declining throughout their range.

Population Trends and Estimates

Partners in Flight (2014) estimated the population consists of 870,000 individuals, with 460,000 individuals in Canada and 410,000 individuals in the U.S.. Breeding Bird Survey data for the period 1966-2012 indicates that Black-billed Cuckoos are declining across their range at approximately 2% per year (see Table 8). Across Region 6, BBS data shows that Black-billed Cuckoos are declining at a rate of 4.8% per year. Significant declines have been noted in North Dakota (4.9% annually), Nebraska (4.5%), and Kansas (3.2%; Figure 14; Table 8).

Threats

Habitat Fragmentation

This species may be harmed by habitat fragmentation. Habitat patch size has been correlated with abundances in Black-billed Cuckoos. In Saskatchewan, Black-billed Cuckoos were not found in aspen groves smaller than 1.2 ha. In New Jersey, they were only observed in forest plots of 7.5 and 24 ha. (Galli et al. 1976). Increased habitat fragmentation could result in decreased abundances in this species. Habitat modification could also result in decreased abundances. Black-billed Cuckoos absence in Cape May, NJ could be the result of the removal of undergrowth vegetation (Sibley 1997). However, Beaudry et al. (2013) found that while suitable habitat in northern Wisconsin is forecast to decrease, Black-billed Cuckoos are not expected to be as negatively affected as most other species.

Pesticides and Contaminants

There is little information available on the effects of pesticides on Black-billed Cuckoos. They are likely susceptible to accumulating pesticide-residue because their primary food source is noxious caterpillars (Hughes 2001). Tissue collected from a cuckoo in Florida showed chlorinated hydrocarbon pesticide residues (Grocki and Johnston 1974).

Effects of Climate Change

The sensitivity score for Black-Billed Cuckoo was not assessed by the Climate Change Sensitivity Database (Tomasevic 2010). Changes to prey populations from climate change could lead to declines in this species, as a result of the link between food availability and Black-Billed Cuckoo abundance (Sharpe et al. 2001). Matthews et al. (2011) suggest that the amount of suitable habitat for Black-billed Cuckoos in the U.S. could increase by as much as 7.2% or decline by as much as 31.2% depending upon the emission scenario. Hitch and Leberg (2007) found that the breeding range of Black-billed Cuckoos shifted north by 276 km over a 26 year period.

Effects of Energy Development

There is little information that is available on the effects of energy development on the Black-billed Cuckoo. One possible effect of energy development is habitat fragmentation and modification. The reduction of habitat size and habitat modification that results from energy development could lead to decreased Black-billed Cuckoo abundance (Galli et al. 1976, Sibley 1997).

Management

Management of this species is not well studied. They may be susceptible to habitat fragmentation and maintaining larger patches of habitat could help to preserve this species (Galli et al. 1976). Maintaining undergrowth vegetation could also help to preserve this species (Sibley 1997).

Conservation

This species is listed as High Priority concern on the Audubon WatchLists for 16 states: Iowa, Minnesota, Illinois, Indiana, Michigan, Ohio, Wisconsin, North Dakota, South Dakota, Massachusetts, Maine, Connecticut, New Hampshire, New Jersey, Rhode Island, and New York (Bonney et al. 1999). No species-specific conservation measures have been taken for this species (Hughes 2001).

Completed and Ongoing Conservation Actions

No species-specific conservation actions have been taken at this time (Hughes 2001).

TABLE 7. Black-billed Cuckoo status rangewide summarized by multiple listing agencies. IUCN is an abbreviation for "International Union for Conservation of Nature" and data comes from IUCN (2014), ABC is an abbreviation for "American Bird Conservancy" and data is from ABC (2012), and "PIF" is an abbreviation for "Partners in Flight" and data comes from PIF (2014). A hyphen (-) indicates a lack of data. For the ABC Conservation Assessment, "Secure" species have no immediate conservation issues, "Potential Concern" species have smaller populations or ranges or at higher rates of population declines, "Vulnerable" species deserve conservation attention, and "At Risk" species need more urgent conservation attention. The "Birds of Conservation Concern" row shows the Bird Conservation Regions (BCR) and US Fish & Wildlife Region where this species is considered to be of conservation concern (USFWS 2008).

IUCN	Least Concern
Federal listing	No
ABC Conservation Assessment	Vulnerable
Birds of Conservation Concern	BCR 11, BCR 13, BCR 17, BCR 22, BCR 23, USFWS Region 3, USFWS Region 6
PIF	U.S. – Canada Concern Species

TABLE 8. Black-billed Cuckoo status summarized by Natural Heritage rankings, BBS trends for 1966 – 2012, BBS trends for 2000 – 2012, and multiple listing agencies. SGCN=Species of Greatest Conservation Need. A hyphen (-) = lack of data. For the natural heritage rankings, G = global and S = state, where S5 = secure (common, widespread, abundant, and lacking major threats or long-term concerns), S4 = apparently secure (uncommon but not rare, but with some cause for long-term concern, usually having more than 100 occurrences and 10,000 individuals), S3 = Vulnerable (rare; typically having 21 – 100 occurrences, or 3,000 – 10,000 individuals), S2 = Imperiled (typically having 6 – 20 occurrences, or 1,000 – 3,000 individuals), and S1 = Critically imperiled (typically having five or fewer occurrences, or 1,000 or fewer individuals). Natural Heritage rankings are only for breeding populations. For the BBS trends, data with an important deficiency are labeled as "Insufficient data". The BBS trends are annual changes. Numbers in parentheses are 95% confidence intervals.

	Natural Heritage Ranking	BBS Trend (1966 – 2012)	BBS Trend (2002-2012)	State Listing	SGCN
Rangewide	G5	-2.0% (-9.0, -0.8%)	1.62 (-2.16, 6.08%)	-	-
Region 6	-	-4.8% (-13.5, -3.4%)	-3.5% (-7.4, 0.7%)	-	-
Montana	S3B	Insufficient data	Insufficient data	Species of Concern	Tier II
North Dakota	SNRB	-4.9% (-7.0, -2.9%)	-3.6% (-11.0, 4.0%)	-	Level I
South Dakota	S4B	-	-	-	-
Wyoming	S2	Insufficient data	Insufficient data	-	-
Colorado	S2B	-	-	-	-
Utah	-	-	-	-	Tier III
Nebraska	S5	-4.5% (-6.7, -2.3%)	-4.4% (-9.6, 0.8%)	-	-
Kansas	S3B	-3.2% (-5.4, -1.3%)	-4.3% (-12.7, 1.9%)	-	Tier I

Prairie Falcon (*Falco mexicanus*)

Figure 15. There is wide uncertainty about the number of Prairie Falcons in North America, with estimates ranging from 8600 to 72,000 individuals. Photo by Bill Adams.

Summary

- Prairie Falcons are medium-sized falcons that are approximately the size and shape of a Peregrine Falcon. However, they are typically paler brown above and have black coverts and axillaries on the underside of the wing that are visible in flight. Prairie Falcons are typically found in dry plains or shrub-steppes which also contain cliffs or bluffs.
- The breeding range of Prairie Falcons extends from Nuevo Leon in Mexico west to Baja California and north to extreme southern British Columbia and Saskatchewan. The non-breeding range includes the breeding range and also extends east to Minnesota and Missouri.
- There is considerable disagreement on population size. Wheeler (2003) estimated a population of 8600 – 12,000 individuals, while Partners in Flight (2014) estimates that there are 72,000 individuals. Prairie Falcons are considered to be a Level I / Tier I species in Colorado and are a Tier II species in Montana, North Dakota and Utah.
- Christmas Bird Count data suggest that Prairie Falcons are increasing at a rate of 0.007% per year. There is insufficient information rangewide to determine trends using Breeding Bird Survey data, and no trend is apparent in Region 6.

Legal Status

The Migratory Bird Treaty Act (MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA protects any migratory bird under 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Status rangewide is summarized by Tables 9 and 10.

Description

The adult Prairie Falcon resembles an immature Peregrine Falcon (*Falco peregrinus*) but is paler. The Prairie Falcon is buff-scaled brown above and has a whitish supercilium (Figure 15). It has a whitish throat and sides of neck. A vague brownish postocular patch is present along with a dark brown vertical streak under the eye. Immature Prairie Falcons are dark brown above and heavily brown-streak cinnamon below. Males are 41 cm in length and females are larger at 48 cm. Males have a wingspan of 1 m, while females have a 1.1 m wingspan. Males weigh 0.6 kg and females weigh 0.8 kg (Oberholser 1974).

Prairie falcons are solitary hunters. This species is usually seen alone or in pairs on telephone poles, fence posts, or dead trees. Prairie Falcons in flight move with choppy wingbeats at 15 to 91 m in the air (Oberholser 1974).

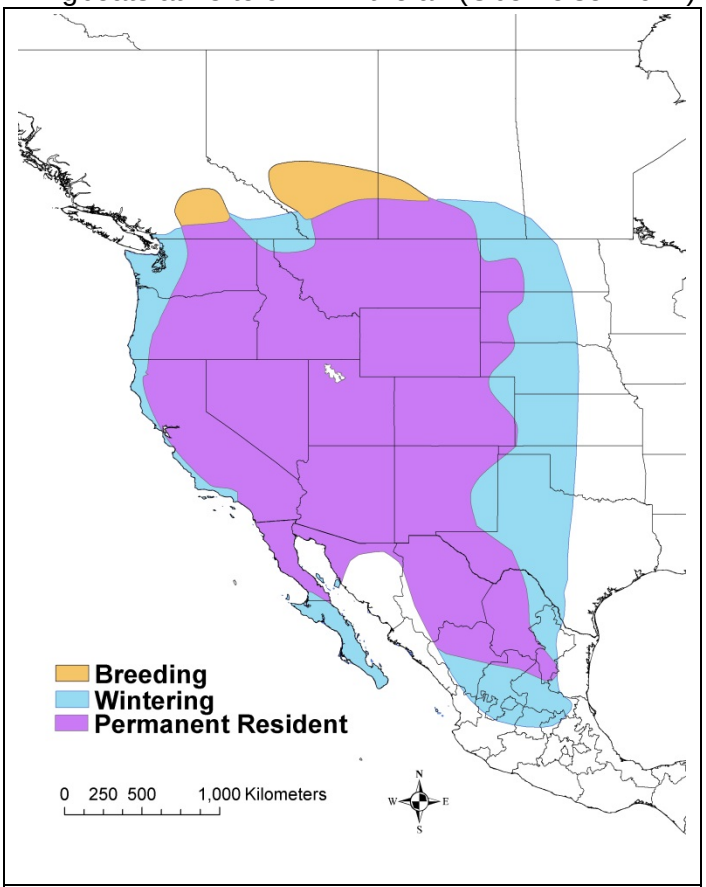

Figure 16. Prairie Falcons breed from Nuevo Leon west to Baja California, and north to British Columbia and Saskatchewan. This map was created using data provided by BirdLife International and NatureServe (2012).

Distribution

Rangewide

Prairie Falcons range from central British Columbia to western North Dakota, south to Baja California, and Nuevo Leon (Fig 16). Steenhof et al. (2005) note that birds breeding in southwestern Idaho traveled east to spend the summer, east of the Continental Divide. This species' winter range includes much of its breeding range and extends south in Mexico to Zacatecas, Hidalgo and Oaxaca (Oberholser 1974) and east to Minnesota and Missouri (Steenhof 2013).

Region 6

Colorado: Prairie Falcons are uncommon during spring, winter, and fall across the state (Andrews and Righter 1992). These birds breed across much of the state as long as rocky cliffs are present. Substantial numbers breed in Las Animas and Baca Counties and along the Front Range (Kingery 1998). It is estimated that there are between 190 and 500 pairs in the state (Andrews and Righter 1992, Kingery 1998).

Kansas: Prairie Falcons are considered to be uncommon transients and winter residents in Kansas but are rarer east of the Flint Hills (Thompson 2011). They are present year-round in extreme western Kansas but breeding has not been confirmed in the state (Busby and Zimmerman 2001).

Montana: Prairie Falcons are present throughout the state of Montana but do not breed in the extreme northwestern and extreme eastern portions of the state (Montana Bird Distribution Committee 2012, Montana Field Guide 2014).

Nebraska: Prairie Falcons breed in the northwestern portions of the state (Johnsgard 1979, Sharpe et al. 2001). They are uncommon residents in the west and become progressively rarer to the east (Sharpe et al. 2001).

North Dakota: Prairie Falcons are uncommon during spring, locally uncommon during the summer, locally fairly common during fall, and are rare in winter (Faanes and Stewart 1982). Breeding Prairie Falcons can be found in the western portions of the state (Johnsgard 1979), with most breeding records coming from Billings and McKenzie Counties (Stewart 1975). Allen (1987) estimated the North Dakota breeding population to consist of 125 ± 94 pairs.

South Dakota: Breeding Prairie Falcons are uncommon residents in the extreme western parts of the state (Johnsgard 1979, Tallman et al. 2001). During the Breeding Bird Atlas, confirmed breeding records were restricted to the Badlands, the Black Hills, and Harding County (Peterson 1995). They are uncommon migrants and winter residents in the west, becoming rare in the east (Tallman et al. 2001)

Utah: Prairie Falcons are uncommon permanent residents throughout Utah (Utah Bird Record Committee 2014).

Wyoming: Prairie Falcons are uncommon residents and have a low-density presence year round in Wyoming (Faulkner 2010). Wheeler (2003) estimates that there are 820 pairs in the state.

Biology

General

Prairie Falcons usually hunt during the early morning and evenings. It is generally agreed that the preferred prey items of Prairie Falcons are ground squirrels (Steenhof and Kochert 1988, Steenhof 2013). However, Oberholser (1974) maintains that Prairie Falcons prefer to consume sparrows, Brewer's Blackbird (*Euphagus cyanocephalus*) and meadowlarks (*Sturnella* spp.), but will also eat quail (Family Odontophoridae), pigeons (*Columba* spp.), doves (*Zenaida* spp.), jays (*Cynocitta* spp.) and sometimes ducks (*Anas* spp.), coots (*Fulica americana*) and gulls (*Larus* spp.). Prairie Falcons will prey upon Brazilian Free-tailed Bats (*Tadarida brasiliensis*; Yancey et al. 1996) and will also hunt for reptiles and large insects (Wheeler 2003). Aerial hunting is done with surprise-and-flush tactics. Prairie Falcons generally hunt alone, but have been seen hunting in pairs, with one bird flushing and the other chasing. This species is generally solitary, but 2-4 juveniles are often seen together post-fledging and during the fall migration (Wheeler 2003).

The most commonly heard vocalization in this species is a repetitive, harsh and rapid *caack-caack-caack-caack*. Males have a higher pitched call than females. During courtship and near nest sites, an *eechip* or *eechup* call can be heard (Wheeler 2003).

Breeding

Prairie Falcons begin breeding when they are two years old. This species arrives on their nesting grounds in late February or early March. Nest sites from the previous year will frequently be reused. The male does most of the hunting during the courtship period, while the female does most of the incubation. The eggs are pinkish buff with red or brown spotting and are typically laid in clutches of 3-6 eggs. The incubation period of this species is around 30 days and begins when clutch is almost complete. Young begin to get their flight feathers at about 30 days. Chicks fledge around 40 days old (Johnsgard 1979, Steenhof 2013).

Prairie Falcons aggressively defend their nests against Common Ravens (*Corvus corax*), Red-tailed Hawks (*Buteo jamaicensis*), Golden Eagles (*Aquila chrysaetos*), Turkey Vultures (*Cathartes aura*), Northern Harriers (*Circus cyaneus*), American Kestrels (*Falco sparverius*), and Bobcats (*Lynx rufus*). Prairie Falcons respond to avian threats to the nest site by vocalizing and/or chasing the threats, while they respond to ground predators by chasing them away (Holthuijzen and Oosterhuis 2004).

Prairie Falcon reproduction is closely tied to ground squirrel abundance in many areas (Steenhof et al. 1999). In times of decreased prey populations, Prairie Falcons have been known to stop nesting. This was observed in Wyoming where an early spring snowstorm reduced the number of prey-sized birds that were available for Prairie Falcons (Squires et al. 1991).

Wintering

The principle winter foods for Prairie Falcons are Horned Larks (*Eremophila alpestris*) and Western Meadowlarks (*Sturnella neglecta*; Steenhof 2013). Increasing populations of Prairie Falcons on their wintering grounds is correlated with increased numbers of Horned Larks. The most common hunting strategy used by this species during the winter months is still-hunting (Enderson 1964).

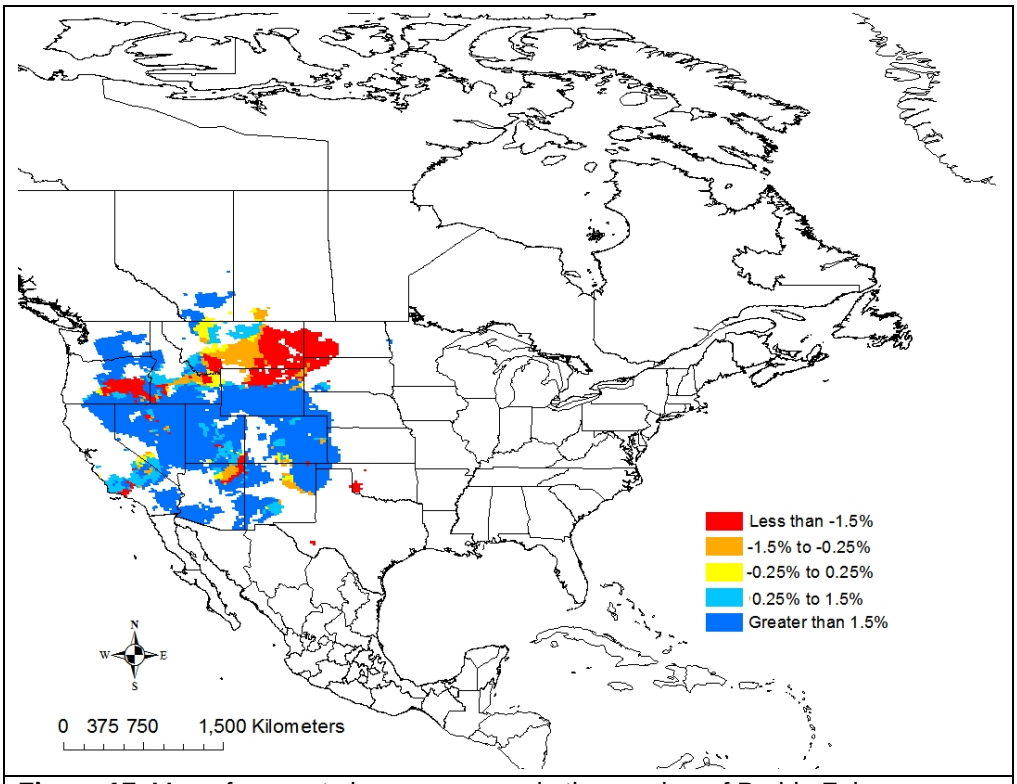

Figure 17. Map of percent change per year in the number of Prairie Falcons detected during the Breeding Bird Survey (BBS) for the period 1966 – 2012 from Sauer et al. (2014). Although populations appear to be generally increasing, the increases are not statistically significant (Table 10)

Habitat

Breeding

During the breeding season, Prairie Falcons prefer arid plains and steppes where cliffs are present for nesting (Brown and Amadon 1968). Squires et al. (1993) found that Prairie Falcons in Wyoming prefer grassland habitats that lacked sagebrush when available. In contrast, Prairie Falcons prefer areas of mixed shrub habitats in Utah (Peterson 1988). In Arizona, Prairie Falcons prefer desert grassland, chaparral, and creosote/bursage habitats (Millsap 1981), while Prairie Falcons in Idaho prefer perennial grasses and low shrubs (Marzluff et al. 1997).

Migration

Habitat during migration is similar to habitat during winter and summer (Wheeler 2003). In general, Prairie Falcons prefer to migrate through open grassland habitats (Steenhof et al. 1999). However, during migration, Prairie Falcons will also migrate through montane meadows, alpine tundra and subalpine habitat in Alberta (Dekker 1984). In general, individuals that have been banded in Canada avoid using forested habitats during migration (Schmutz et al. 1991).

Winter

The grassland habitats of the Great Plains and a few areas west of the Rocky Mountains are the preferred winter habitats of Prairie Falcons (Schmutz et al. 1991, Steenhof et al. 1999). In Arizona, Prairie Falcons prefer to winter in desert grasslands and creosote bush-bursage habitats (Millsap 1981). Prairie Falcons in Utah are associated with grassland flats and wheat fields (White and Roseneau 1970). In Washington, Colorado and Wyoming, Prairie Falcons were found to mainly use irrigated croplands and winter wheat fields (Enderson 1964, Parker 1972, Beauvais et al. 1992). In winter, this species is usually solitary, unless there is an abundance of prey present. Prairie Falcons are highly nomadic during this season, usually following prairie passerines. However, they abandon nomadism if there is stable and abundant prey (Wheeler 2003).

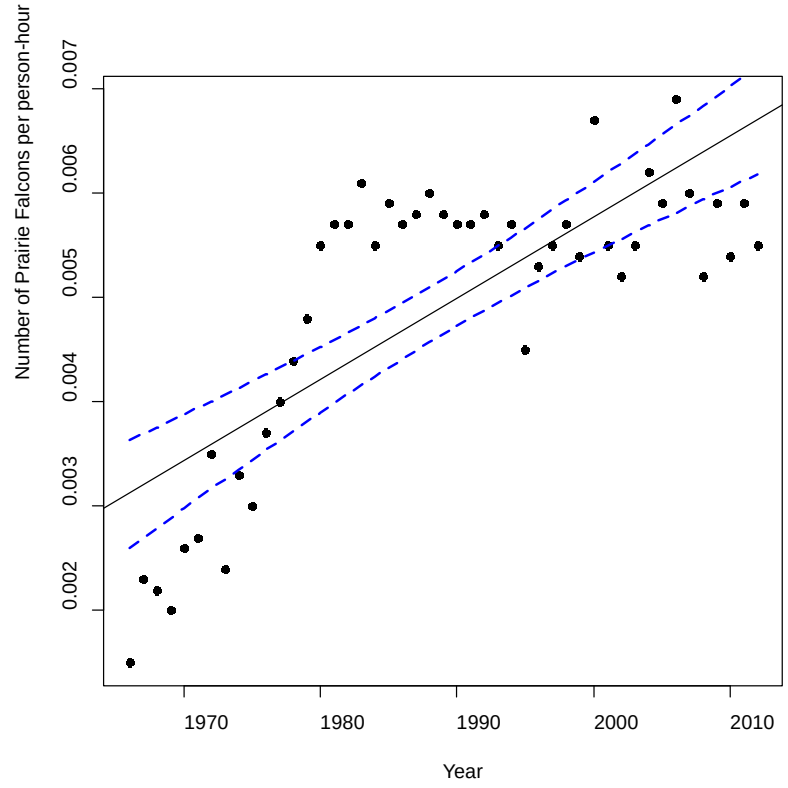

Figure 18. The number of Prairie Falcons detected per party-hour during CBCs in the U.S. and Mexico for the period for the period 1966 – 2012 increased at a rate of 0.007% per year. Dashed lines indicate 95% confidence intervals. This figure was created using data from the National Audubon Society (2014).

Population Trends and Estimates

Wheeler (2003) estimates 8,600 – 12,000 individuals (i.e., 4,300 – 6,000 pairs), with 1,200 pairs in Nevada. Steenhof et al. (2013) suggests that the population consists of 8,546 individuals (i.e.,4,273 pairs). In contrast, Partners in Flight (2014) estimates that there are 72,000 individuals in North America. In general, there is insufficient data to determine trends based upon Breeding Bird Survey data (Table 10; Figure 17). No significant changes have been detected along BBS routes within Region 6 (Table 10). However, there has been a significant increase in the number of Prairie Falcons detected on Christmas Bird Counts for the period 1966 – 2012 ($F_{1,45} = 65.83$, $R^2 = 0.58$, $p < 0.001$; Fig. 18).

Threats

Habitat Degradation

Habitat loss is a threat to the Prairie Falcon. Population declines of Prairie Falcons may be related to the loss of shrubland in Idaho (Steenhof et al. 1999). Another threat to Prairie Falcon habitat is urban and suburban expansion (Berry et al. 1998, Wheeler 2003). The loss of open spaces due to the expansion of urban and suburban areas has the potential to lead to the decline of many diurnal raptors, including Prairie Falcon (Berry et al. 1998). The loss of cover for prey, poisoning, and the use of farm machinery, prevent ground squirrels from maintaining populations in agricultural areas, which negatively effects Prairie Falcon populations (Steenhof 2013).

Pesticides and other Toxins

Prairie Falcon eggs collected in California from 1986-1989 had lower levels of both ∑chlordane levels and ∑PCB levels than eggs from Peregrine Falcons (Jarman et al. 1993). Prairie Falcons are less exposed to pesticides than other falcons, because they primarily feed on mammals, but effects of DDE have been shown to cause eggshell-thinning when exposed at certain levels (Fyfe et al. 1976, Steenhof 2013). High levels of HCB and DDE can cause reproductive failure (Jarman et al. 1996). Although this species may also be contaminated by other toxins and chemicals, none were shown to have negative effects (Steenhof 2013).

Effects of Climate Change

The sensitivity score for Prairie Falcon was not assessed by the Climate Change Sensitivity Database (Tomasevic 2010). NatureServe's climate change vulnerability assessment ranks Prairie Falcons in California as either moderately vulnerable or presumed stable, depending upon the climate change model chosen (Siegel et al. 2014). Paprocki et al. (2014) noted that there has been a northward shift in wintering Prairie Falcons. Increasing wildfires that are associated with climate change could result in the degradation of habitat for the Prairie Falcon (Running 2006). In addition, Steenhof et al. (1999) noted that precipitation affects breeding success and so predicted changes in precipitation may alter breeding success during the 21st century.

Effects of Energy Development

Prairie Falcons have been shown to be sensitive to increased human activity (Berry et al. 1998). Consequently, Prairie Falcons tolerate low levels of oil development near foraging sites, as long as human disturbance and activity is kept to a minimum. Prairie Falcons do avoid flying over oil fields, but will forage in the undisturbed areas between wells. They were never observed perching on, or hunting from, the actual drill pad, but they were seen perching on power lines leading to wells. Energy development may eventually have a detrimental effect on Prairie Falcons if oil well densities become too great, but the level at which this would occur has not been established (Squires et al. 1993).

Management

To maintain Prairie Falcon populations, native plant communities should be restored and incompatible land use should be regulated (Steenhof et al. 1999). There should be a focus on maintaining and enhancing nest site availability, ensuring habitat for prey species, reducing amount of human disturbance, and restoring populations to areas with reduced or extirpated populations (Steenhof 2013). Prairie Falcons will use artificial aeyries (Mayer and Licht 1995) and this can be used to enhance nest site availability. On the wintering grounds, Holmes et al. (1993) suggests that human observers on foot or in vehicles should remain more than 160 m away from perched Prairie Falcons.

Conservation

Conservation efforts should be focused on maintaining and enhancing nest site availability, managing foraging areas to provide habitat for prey, reducing human disturbance, and restoring populations to areas with reduced or extirpated populations (Steenhof 2013).

Completed and Ongoing Conservation Actions

In 1993, Congress designated the Snake River as a Bird of Prey National Conservation Area. This legislation protected 196 square km of important nesting and foraging habitat for the Prairie Falcon. Mining and agricultural development were banned in the area. In addition, Prairie Falcons have been reintroduced in areas of Alberta and California to increase wild populations (Steenhof 2013).

TABLE 9. Prairie Falcon status rangewide summarized by multiple listing agencies. IUCN is an abbreviation for "International Union for Conservation of Nature" and data comes from IUCN (2014), ABC is an abbreviation for "American Bird Conservancy" and data is from ABC (2012), and "PIF" is an abbreviation for "Partners in Flight" and data comes from PIF (2014). A hyphen (-) indicates a lack of data. For the ABC Conservation Assessment, "Secure" species have no immediate conservation issues, "Potential Concern" species have smaller populations or ranges or at higher rates of population declines, "Vulnerable" species deserve conservation attention, and "At Risk" species need more urgent conservation attention. The "Birds of Conservation Concern" row shows the Bird Conservation Regions (BCR) and US Fish & Wildlife Region where this species is considered to be of conservation concern (USFWS 2008).

IUCN	Least Concern
Federal listing	No
ABC Conservation Assessment	Potential Concern
Birds of Conservation Concern	BCR 16, BCR 17, BCR 18, BCR 33, USFWS Region 6
PIF	Not a U.S. – Canada Concern Species

TABLE 10. Prairie Falcon status summarized by Natural Heritage rankings, BBS trends for 1966 – 2012, BBS trends for 2000 – 2012, and multiple listing agencies. SGCN=Species of Greatest Conservation Need. A hyphen (-) = lack of data. For the natural heritage rankings, G = global and S = state, where S5 = secure (common, widespread, abundant, and lacking major threats or long-term concerns), S4 = apparently secure (uncommon but not rare, but with some cause for long-term concern, usually having more than 100 occurrences and 10,000 individuals), S3 = Vulnerable (rare; typically having 21 – 100 occurrences, or 3,000 – 10,000 individuals), S2 = Imperiled (typically having 6 – 20 occurrences, or 1,000 – 3,000 individuals), and S1 = Critically imperiled (typically having five or fewer occurrences, or 1,000 or fewer individuals). Natural Heritage rankings are only for breeding populations. For the BBS trends, data with an important deficiency are labeled as "Insufficient data". The BBS trends are annual changes. Numbers in parentheses are 95% confidence intervals.

	Natural Heritage Ranking	BBS Trend (1966 – 2012)	BBS Trend (2000 – 2012)	State Listing	SGCN
Rangewide	G5	Insufficient data	Insufficient data	-	-
Region 6	-	0.7% (-0.4, 1.7%)	1.7% (0.0, 3.5%)	-	-
Montana	S4	Insufficient data	Insufficient data	-	Tier II
North Dakota	S3	Insufficient data	Insufficient data	-	Level II
South Dakota	S3/S4B, S4N	Insufficient data	Insufficient data	-	-
Wyoming	S4	0.1% (-1.8, 2.0%)	0.6% (-2.6, 4.6%)	-	-
Colorado	S4	Insufficient data	Insufficient data	-	Species of Greatest Conservation Concern
Utah	S4	0.9% (-1.2, 3.4%)	1.5% (-2.6, 4.6%)	-	-
Nebraska	S3	Insufficient data	Insufficient data	-	Tier II
Kansas	SNA	-	-	-	-

Loggerhead Shrike (*Lanius ludovicianus*)

Figure 19. Loggerhead Shrikes perch in the open on treetops and wires, keeping a watchful eye for prey. Photo by Chris Butler.

Summary

- Loggerhead Shrikes are gray above, white below, and have black wings, a black-and-white tail, and a black mask. This carnivorous passerine impales its prey on twigs, barbed wire fences and other sharp objects.
- The breeding range of this species stretches from Alberta south to Baja California and east to Ontario and Florida. Loggerhead Shrikes winter from northern California east to Pennsylvania and south to Chiapas, Mexico.
- The population of Loggerhead Shrikes is estimated to consist of 5,800,000 Individuals. Loggerhead Shrikes are considered to be a Level I / Tier I species in Colorado, Kansas, and Nebraska, and are a Tier II species in Montana and North Dakota.
- The number of Loggerhead Shrikes detected per party-hour on Christmas Bird Counts is declining at a rate of 0.3% per year. Rangewide, the number of Loggerhead Shrikes detected on Breeding Bird Surveys is declining at a rate of 3.2% annually. For Region 6, the decline is 2.2%, with significant declines noted in South Dakota, Nebraska, and Kansas.

Legal Status

The Migratory Bird Treaty Act (MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA protects any migratory bird under 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Status rangewide is summarized by Tables 11 and 12.

Description

Loggerhead Shrikes are large-headed passerines (Fig. 19). They are 210 mm in length and weigh 47.5 g. They are gray, black and white in color. Loggerhead Shrikes are gray above, white below, and have a black facial mask as well as black wings. Sometimes there is faint barring on the chest. Their bill is curved and black. A pair of tomial teeth is present on the maxilla. Their legs and feet are black in color. This species is similar to the Northern Shrike (*Lanius excubitor*) but is smaller and has a wider black mask. They are sometimes confused with Northern Mockingbird, but that species does not have a black facemask or black wings (Yosef 1996).

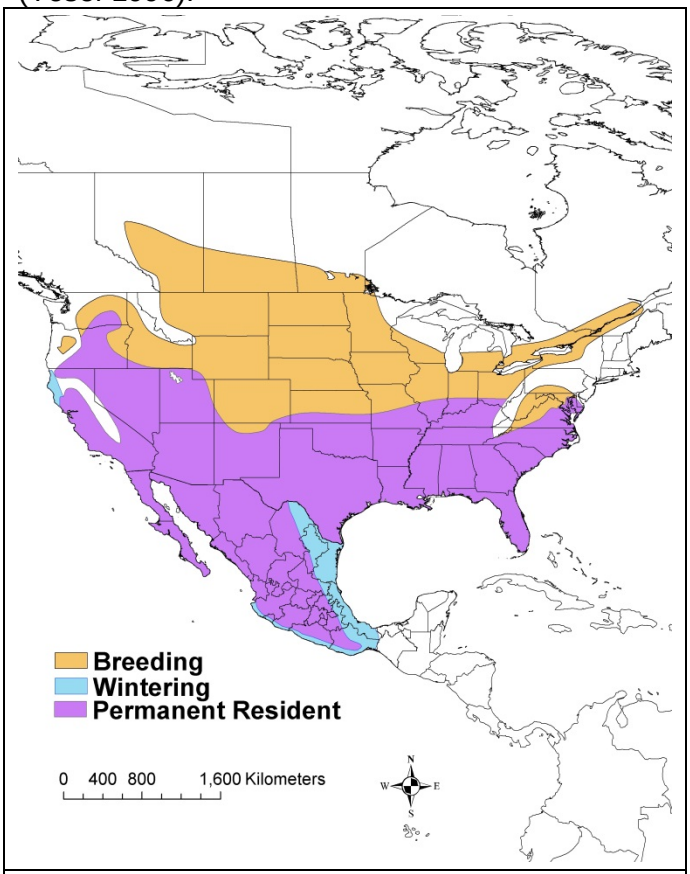

Figure 20. Loggerhead Shrikes formerly bred from Quebec west to Washington and south through Mexico. Loggerhead Shrikes are permanent residents from Delaware west to southern Washington and south through Mexico. This map was created using data provided by BirdLife International and NatureServe (2012).

Distribution

Rangewide

The breeding range of this species extends from Mexico to southern Canada (Ryser 1985; Fig. 20). Loggerhead Shrikes breed from Alberta south to Baja California and east to Ontario and Florida. (Yosef 1996). They winter from California east to Pennsylvania and south to Chiapas, Mexico with a few birds overwintering north to Washington (Yosef 1996). They are not found in far southern Mexico (Oberholser 1974). Loggerhead Shrikes formerly bred in the northeastern US, but the species no longer breeds regularly north of Virginia, with the exception of a small population in Pennsylvania (Cade and Woods 1997, Yosef 1996).

Region 6

Colorado: Loggerhead Shrikes breed throughout the state, but the highest densities of breeding Loggerhead Shrikes occur in the eastern portion of Colorado (Kingery 1998). Eastern Colorado is one of the few places in North America where Loggerhead Shrike populations are stable (Wiggins 2005). They are also fairly common in the western valleys and San Luis Valley (Andrews and Righter 1992). Loggerhead Shrikes are uncommon to rare in Colorado during the winter and are primarily restricted to southern and western Colorado (Andrews and Righter 1992).

Kansas: Loggerhead Shrikes are abundant east of the Flint Hills. West of the Flint Hills they are less common but can be found in overgrazed prairies (Busby and Zimmerman 2001). Loggerhead Shrikes are rare in Kansas during the winter (Thomson et al. 2011).

Montana: This species can be found breeding throughout the central and eastern portions of the state but is only a transient in western Montana. Relative density is highest in the eastern one-third of the state (Montana Bird Distribution Committee 2012, Montana Field Guide 2014).

Nebraska: This species is found breeding throughout the state, but less abundantly in eastern half of the state. They are found in higher numbers in the Sandhills and western half of the state (Molhoff 2001). Loggerhead Shrikes are regular migrants across the state. They are rare but regular in the southeast corner of the state (Sharpe et al. 2001).

North Dakota: Loggerhead Shrikes are uncommon migrants but fairly common summer residents in North Dakota (Faanes and Stewart 1982). Loggerhead Shrikes are common breeding birds in the southern portion of the Little Missouri Slope. They are fairly common on the Northwestern Drift Plain, the northern portion of the Little Missouri Slope, and south of the Agassiz Lake Plain Region. They are considered uncommon and local in the Southern Drift Plain, Northeastern Drift Plan, Agassiz Lake Plain and the Turtle Mountains (Stewart 1975).

South Dakota: Loggerhead Shrikes are found throughout the state (Peterson 1995). They are a uncommon to fairly common summer resident, but are less common to the east and rare in the Black Hills (Peterson 1995, Tallman et al. 2002).

Utah: Loggerhead Shrikes are common permanent resident throughout the state (Utah Conservation Data Center 2013, Utah Bird Record Committee 2014).

Wyoming: Loggerhead Shrikes are classified as uncommon summer resident. They breed throughout the state in suitable habitat although they are most frequent on the eastern plains (Faulkner 2010).

Biology

General

The diet of Loggerhead Shrikes consists of arthropods, amphibians, reptiles, small mammals and birds (Yosef 1996). They have also been known to eat carrion (Anderson 1976). The tomial tooth is used to quickly cut the spinal cord of its prey, paralyzing the prey and making it easier to kill (Cade 1967). The Loggerhead Shrike catches and carries only one prey item at a time (Yosef 1996). They are capable of carrying prey that weighs as much as their own body mass (Yosef 1996).

Loggerhead Shrikes are sit-and-wait predators, frequently perching on treetops or wires (Yosef 1996). They then dive from these high perches when prey is spotted. After prey is captured, it is often impaled on sharp objects (Miller 1931, Bent 1950). During the winter, Loggerhead Shrikes will create caches of impaled prey that can be used as reserves when food abundance is low (Watson 1910). During the breeding season, males will add to these caches while females will both consume the cached prey and bring some prey items back to the nest to feed the chicks (Applegate 1977).

The vocalizations of Loggerhead Shrikes have not been studied in detail (Yosef 1996). The spring song of males is made up of short trills and combinations of notes. These are repeated several times with varied rhythm, pitch and quality. The territorial song of males is similar to the spring song but rougher in quality (Miller 1931).

Breeding

Loggerhead Shrikes nest earlier in the season than other passerines (Yosef 1996). The breeding season begins in mid-February in southern portions of their range, and late April in the northern portions of their range. The female builds the nest over 6-11 days. The nest is built 1-5 m above the ground. Nests are typically built in shrubs or low trees (Baicich and Harrison 2005). The nest is made from thick twigs and is lined with rootlets or fiber (Bent 1950). They are often padded with cotton, string, or feathers (Bent 1950).

The female lays 4-5 eggs which are subelliptical in shape. The eggs are colored white, creamy-white or buff. The eggs are speckled, spotted or blotched with brown, purplish-brown or pale buff, purple or gray. They are 24 mm long and 19 mm wide (Baicich and Harrison 2005).

The female incubates the eggs alone for 14-16 days. Nestlings are altricial and downy with bright orange skin. Both parents tend to the young. While the female broods, the male brings food back to the nest. The young acquire their feathers by 15 days and leave the nest at 17-21 days. They are independent at 40-45 days (Baicich and Harrison 2005).

Wintering

Shortgrass areas are preferred for grasshopper (Orthoptera) foraging during winter and fall, because the prey is more difficult to see and catch in tall grass areas (Mills 1979, Gawlik and Bildstein 1993). In California, they will hunt in the afternoon due to increased prey activity (Craig 1978). Migrants are solitary during winter, but residents remain paired throughout the year (Yosef 1996).

Habitat

Breeding

Open country with short vegetation is the preferred breeding habitat. For example, Loggerhead Shrikes will breed in pastures with fence rows, old orchards, mowed roadsides, cemeteries, golf courses, agricultural fields, riparian areas and open woodland. Breeding birds prefer to nest in areas with isolated trees or tall shrubs (Yosef 1994). Loggerhead Shrike abundance correlates with percentage of available pastureland (Gawlik and Bildstein 1993).

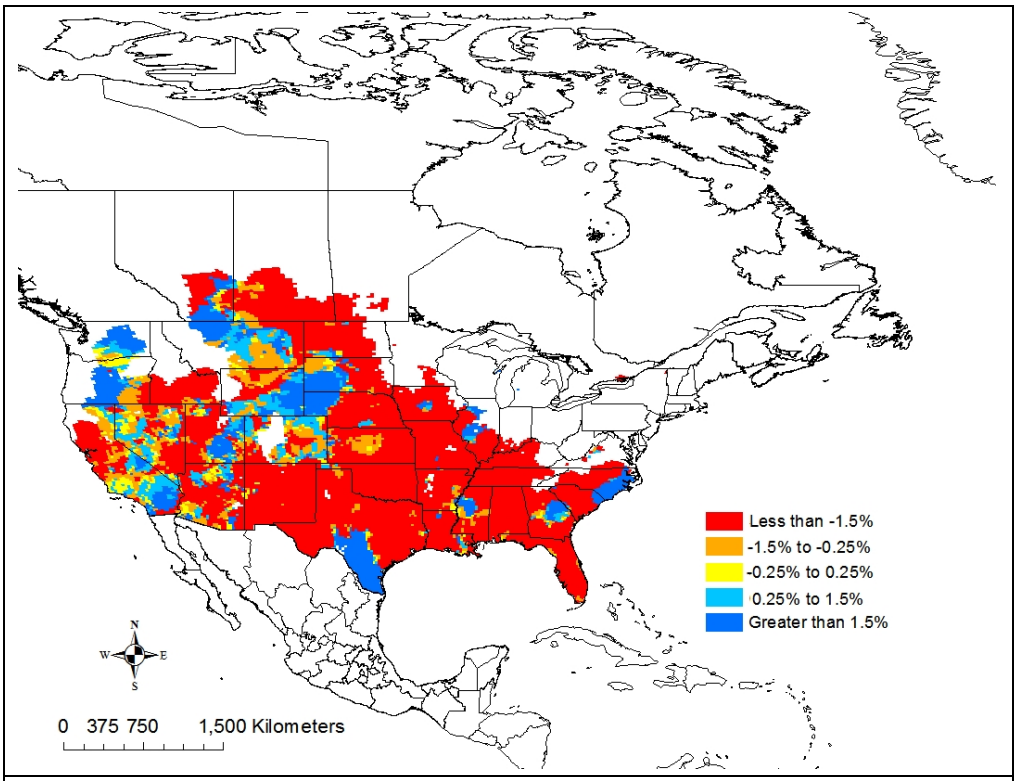

Figure 21. Map of percent change per year in the number of Loggerhead Shrikes detected during the Breeding Bird Survey (BBS) for the period 1966-2012 from Sauer et al. (2014). Loggerhead Shrikes are declining throughout their range and are no longer detected by Breeding Bird Surveys in the northeastern U.S..

Migration

There is no information on the migration habitat for this species. It is probably similar to breeding habitat (Yosef 1996).

Winter

Winter habitat is similar to breeding habitat. Hay fields and idle pastures are preferred (Bartgis 1992). In Virginia, this species moves from pastures to shrubby habitat and forests in the winter (Blumton 1989).

Population Trends and Estimates

There are an estimated 5,800,000 Loggerhead Shrikes. Rangewide declines have been noted by several authors and the potential causes have been summarized in Yosef (1996), Pruitt (2000), and Wiggins (2005). Breeding Bird Surveys from 1966-2012 show a significant rangewide decline of 3.2% annually (Table 12). Significant declines have occurred in Region 6, and are particularly pronounced in South Dakota, Nebraska and Kansas (Fig. 21, Table 12). Likewise, a significant decline in the number of birds detected per party-hour on Christmas Bird Counts was observed during 1966 – 2012 ($F_{1,45}$ = 258.9, R^2 = 0.85, $p < 0.001$; Figure 22).

Threats

Pesticides and Toxins

It is not known to what degree contaminants have played a role in the decline of Loggerhead Shrikes, because the concentrations required to reduce the population is not known at this time. The species' decline has coincided with the use of organochlorines (Yosef 1996). These contaminants may be acquired in their wintering ranges (Anderson and Duzan 1978) from prey that is taken in areas that have been sprayed with these contaminants (Korschgen 1970). See Pruitt (2000) and Wiggins (2005) for more detailed information on this topic.

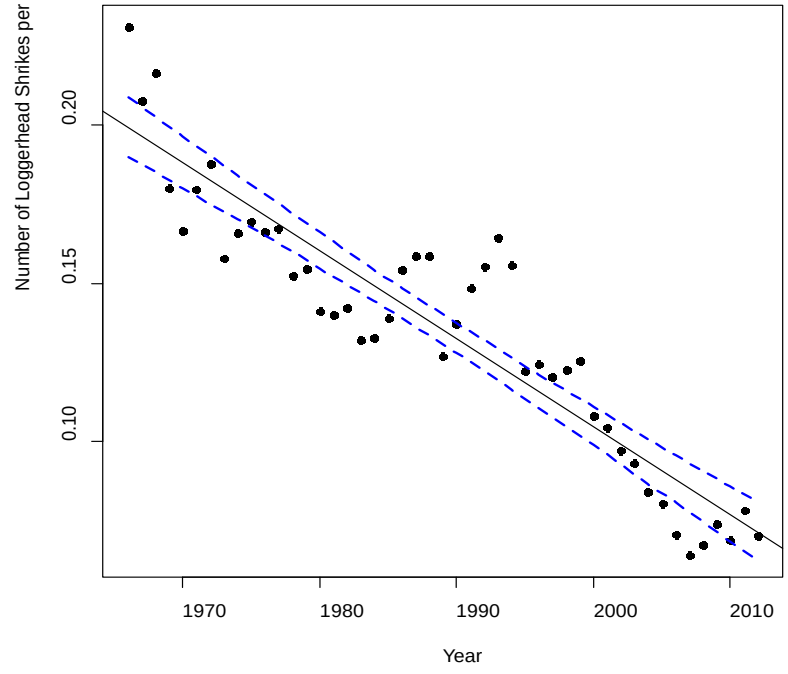

Figure 22. The number of Loggerhead Shrikes detected per party-hour during CBCs in the U.S. and Mexico for the period for the period 1966-2012 changed at a rate of 0.28% per year. Dashed lines indicate 95% confidence intervals. This figure was created using data from the National Audubon Society (2014).

Collisions

The low flight and the proximity of these birds to roadways leads to collisions with vehicles. Blumton (1989) found that 29% of fall and winter mortality of this species was attributed to vehicle collisions. The increase in road and vehicular traffic could play a major role in the population declines in Loggerhead Shrikes (Flickinger 1995). Pruitt (2000) and Wiggins (2005) provide more detail on this topic.

Habitat Degradation

Changing land-use practices have contributed to the decline in Loggerhead Shrike populations. The shift from smaller to larger farms has led to increased fragmentation of suitable habitat. The lack of heterogeneity caused by these large farms leads to a reduction of suitable breeding habitat (Bellar and Maccarone 2002). Pruitt (2000) notes that land-use changes may alter habitat suitability for this species on both its breeding and wintering grounds.

Other threats

West Nile Virus may negatively affect populations of this species (Lindgren et al. 2009). Weather and predation can negatively affect breeding success (Collister and Wilson 2007). Other threats including nest parasitism by cowbirds, human disturbance, and interspecific competition (Pruitt 2000, Wiggins 2005).

Effects of Climate Change

The sensitivity score for the Loggerhead Shrike on the Climate Change Sensitivity Database is “Medium” (Tomasevic 2010). Temperature changes resulting from climate change could have an effect on Loggerhead Shrikes by altering the available habitat. If climate change results in more pastures, this species could benefit (Tomasevic 2010). However, in the Big Bend region of Texas, for example, the effects of climate change are not expected to significantly impact Loggerhead Shrike occupancy (White et al. 2011).

Effects of Energy Development

The effects of energy development on this species have not been well-studied. Meehan et al. (2010) suggest that increased biofuel production of corn and soybeans will lead to decreases in Loggerhead Shrike populations.

Management

One priority for management of this species is determining migration routes, stopover and wintering areas, and those areas sensitive to human disturbance. Another is to determine the dietary needs and what factors influence food availability. Understanding mortality rates of fledged juveniles and adults in different habitats will allow identification of areas that are sources and sinks for this species. Determining how niche overlap and competition affect shrike productivity should also be studied (Yosef 1996).

Conservation

The priority for conservation of this species is to understand what factors have been responsible for its decline. With potentially high reproductive rates, eliminating the factors for decline could result in the expansion of the range and increases in the population (Yosef 1996). Enough quality habitat remains unoccupied to allow for this species’ population to grow (Bartgis 1992).

Completed and Ongoing Conservation Actions

There has not been any large-scale habitat-management programs started at this time (Yosef 1996). A program has been initiated for the San Clemente Loggerhead Shrike in California. This program includes the removal of feral herbivores, reducing and controlling predators, captive breeding and artificial enhancement of reproduction (Morrison et al. 1995).

TABLE 11. Loggerhead Shrike status rangewide summarized by multiple listing agencies. IUCN is an abbreviation for "International Union for Conservation of Nature" and data comes from IUCN (2014), ABC is an abbreviation for "American Bird Conservancy" and data is from ABC (2012), and "PIF" is an abbreviation for "Partners in Flight" and data comes from PIF (2014). A hyphen (-) indicates a lack of data. For the ABC Conservation Assessment, "Secure" species have no immediate conservation issues, "Potential Concern" species have smaller populations or ranges or at higher rates of population declines, "Vulnerable" species deserve conservation attention, and "At Risk" species need more urgent conservation attention. The "Birds of Conservation Concern" row shows the Bird Conservation Regions (BCR) and US Fish & Wildlife Region where this species is considered to be of conservation concern (USFWS 2008).

IUCN	Least Concern
Federal listing	No, but subspecies San Clemente Loggerhead shrike (*Lanius ludovicianus mearnsi*) is endangered
ABC Conservation Assessment	Potential Concern
Birds of Conservation Concern	BCR 9, BCR 10, BCR 17, BCR 19, BCR 21, BCR 22, BCR 24, BCR 25, BCR 27, BCR 28, BCR 29, BCR 30, BCR 31, BCR 32, BCR 35, BCR 37, U.S. Caribbean Islands, USFWS Region 1, USFWS Region 2, USFWS Region 3, USFWS Region 4, USFWS Region 5, USFWS Region 6, USFWS Region 8, National
PIF	Not a U.S. – Canada Concern Species

TABLE 12. Loggerhead Shrike status summarized by Natural Heritage rankings, BBS trends for 1966 – 2012, BBS trends for 2000 – 2012, and multiple listing agencies. SGCN=Species of Greatest Conservation Need. A hyphen (-) = lack of data. For the natural heritage rankings, G = global and S = state, where S5 = secure (common, widespread, abundant, and lacking major threats or long-term concerns), S4 = apparently secure (uncommon but not rare, but with some cause for long-term concern, usually having more than 100 occurrences and 10,000 individuals), S3 = Vulnerable (rare; typically having 21 – 100 occurrences, or 3,000 – 10,000 individuals), S2 = Imperiled (typically having 6 – 20 occurrences, or 1,000 – 3,000 individuals), and S1 = Critically imperiled (typically having five or fewer occurrences, or 1,000 or fewer individuals). Natural Heritage rankings are only for breeding populations. For the BBS trends, data with an important deficiency are labeled as "Insufficient data". The BBS trends are annual changes. Numbers in parentheses are 95% confidence intervals.

	Natural Heritage Ranking	BBS Trend (1966 – 2012)	BBS Trend (2000 – 2012)	State Listing	SGCN
Rangewide	G4	-3.2% (-3.5, -2.9%)	-1.8% (-2.6, -1.0%)	-	-
Region 6	-	-2.2% (-2.6, -1.8%)	-1.6% (-2.6, -0.7%)	-	-
Montana	S3B	-0.8% (-2.1, 0.6%)	-0.7% (-3.2, 1.6%)	Species of Concern	Tier II
North Dakota	SU	-1.4% (-3.4, 0.7%)	-2.1% (-8.6, 4.4%)	-	Level II
South Dakota	S3/S4B	-2.9% (-4.1, -1.7%)	-2.7% (-5.7, 0.9%)	-	-
Wyoming	S3	-0.6% (-2.0, 0.7%)	2.0% (-1.3, 6.5%)	-	-
Colorado	S3/S4B	-0.1% (-1.4, 1.2%)	-0.4% (-4.2, 3.4%)	-	Species of Greatest Conservation Concern
Utah	S4B, S3/S4N	-0.3% (-1.9%, 1.4%)	0.2% (-3.2, 3.4%)	-	-
Nebraska	S2/S3	-2.6% (-3.8, -1.3%)	-1.9% (-4.7, 1.3%)	-	Tier I
Kansas	S4B	-5.7% (-6.7, -4.7%)	-6.7% (-10.3, -3.4%)	-	Tier I

Bell's Vireo (*Vireo bellii*)

Figure 23. The Bell's Vireo was named by John James Audubon in honor of his friend, John Bell. Photo by Dominic Sherony via Wikimedia Commons.

Summary

- Bell's Vireos are relatively nondescript. They are a dull olive-greenish above, with a yellow-green wash on the sides, and pale below. They have two pale wingbars and a broken whitish eyering. Bell's Vireos are often heavily parasitized by Brown-headed Cowbirds.
- This species breeds from northern Mexico north to southern California, through the Great Plains to North Dakota, and east to western Ohio. The winter range of the Bell's Vireo is not well understood, but they appear to winter along the Pacific slope of Mexico south to Nicaragua.
- There are an estimated 4.6 million Bell's Vireos in the world with 3.6 million Bell's Vireos in the U.S. They are a Tier I species in Nebraska and Kansas.
- Very small numbers of Bell's Vireos (10.1 ± 1.7 individuals) are detected annually on Christmas Bird Counts and no population trend is apparent. Across their range, Bell's Vireos are not well sampled by Breeding Bird Surveys and it is not possible to draw conclusions about population trends due to insufficient data. However, in U.S. Fish & Wildlife Service's Region 6, Bell's Vireos are increasing at a rate of 2.1% annually. The observed increase is driven largely by Nebraska, where the population is increasing at a rate of 3.7% annually.

Legal Status

The Migratory Bird Treaty Act (MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA protects any migratory bird under 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Status rangewide is summarized by Tables 13 and 14.

Description

Adult Bell's Vireos are olive gray above with faint white wing bars (Fig. 23). Their underparts are whitish and their flanks are pale yellow (Obersholser 1974). The eastern subspecies *V. b. bellii* is more colorful than the subspecies breeding in California (*V. b. pusillus*) and Arizona (*V. b. arizonae*; Kus et al. 2010). The juvenal plumage is similar in appearance to the adults, but they are whiter below and have more distinct wingbars (Bent 1950, Kus et al. 2010). This vireo is 13 cm in length and has a wingspan of 18 cm. They weigh 7 g (Obersholser 1974). Their bill is short, straight, and blunt-tipped (Kus et al. 2010). A partial postjuvenal molt occurs in July and August. There is no prenuptial molt but they have a complete molt in the late summer (Bent 1950).

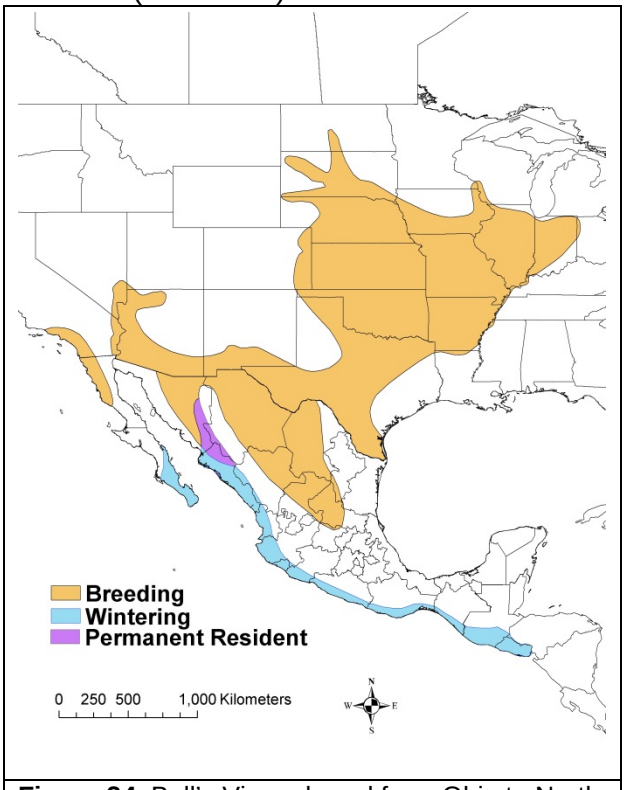

Figure 24. Bell's Vireos breed from Ohio to North Dakota and south to northern Mexico. They breed through the southwestern U.S. and northern Mexico, west to California and Baja California. Bell's Vireos winter along the Pacific slope of Mexico south to Nicarauga. This map was created using data provided by BirdLife International and NatureServe (2012).

Distribution

Rangewide

Bell's Vireos breed from Ohio west through the Great Plains to North Dakota, and through the American Southwest to California and northern Mexico (Fig. 24). The winter distribution is not well understood, but they appear to winter primarily along the Pacific Slope of Mexico south to Nicaragua (Howell and Web 1995; Kus et al. 2010).

Region 6

Colorado: Bell's Vireos are uncommon to fairly common during the breeding season in the far northeast corner of the state (Sedgewick, Logan and Yuma Counties; Andrews and Righter 1992). They were confirmed as breeding in only two blocks during the Colorado Breeding Bird Atlas (Kingery 1998).

Kansas: Bell's Vireos are uncommon to common migrants and summer residents in the eastern half of Kansas but are less common further west (Janzen 2007, Thomson et al. 2011). Their distribution is patchy throughout the state (Busby and Zimmerman 2001).

Montana: The species is hypothetical in the state as both observations (1995 and 2007) were by single observers (Montana Bird Distribution Committee 2012).

Nebraska: This species is found throughout the state. It is generally uncommon to locally common, but is less common in the Panhandle and along the eastern border of the state (Molhoff 2001, Sharpe et al. 2001).

North Dakota: Bell's Vireos are local and rare in North Dakota (Faanes and Stewart 1982). Most reports are along the Missouri River and its tributaries (Stewart 1975).

South Dakota: Breeding Bell's Vireo were found in scattered locations in the central, southeastern and southwestern portions of the state (Peterson 1995). They are considered to be a fairly common summer resident in the Missouri River Valley and are uncommon to rare elsewhere in the southern half of the state (Tallman et al 2002).

Utah: In Utah, this species is classified as an uncommon summer resident and is restricted primarily to Washington and Kane Counties (Kus et al. 2010, Utah Conservation Data Center 2013, Utah Bird Record Committee 2014).

Wyoming: Bell's Vireos do not occur in the state (Faulkner 2010).

Biology

General

Insects are the primary food source for Bell's Vireo, and caterpillars, moths, beetles, true bugs, and grasshoppers are the preferred prey of this species (Chapin 1925, Kus et al. 2010). They can be found foraging at all vegetation levels, but are concentrated in the lower and mid-canopies when nests are active (Kus et al. 2010). During the breeding season, pairs may forage together (Barlow 1962).

This species is rarely found on the ground, spending most of its time hopping between branches (Kus et al. 2010). Their flight is made up of rapid, shallow wingbeats followed by a 0.3 to 5.0 m glide (Barlow 1962).

Peterson et al. (2004) found that Western Scrub-Jay (*Aphelocoma californica*), Virginia opossum (*Didelphis virginiana*), gopher snake (*Pituophis* spp.), and Argentine ants (*Linepithema humile*) were nest predators of Bell's Vireo. Adults may be depredated by mammals, falcons, and accipiters (Kus et al. 2010). This species responds to snake depredation by scolding and flying around the nest (Peterson et al. 2004). They will respond to predators by making alarm calls, scolding calls, and generalized calls (Barlow 1962). Adults will fly through nearby vegetation in response to intruders (Bent 1950). Males will investigate intruders from perches while singing (Nolan 1960).

Breeding

The breeding season begins in early April in the southern extent of their range, and in late May to the north. The breeding season ends in early July (Baicich and Harrison 2005). Males begin establishing territories shortly after they arrive on their breeding grounds. Their territories are roughly 0.4 ha in size. Males will initially attack females until they show submission. The females select nesting sites, but the males begin constructing the nest itself. The nest building process is an important part of the courtship process (Johnsgard 1979). Nests are a deep rounded cup comprised of bark, feathers, grass and leaf fragments (Baicich and Harrison 2005; Figure 25). It takes 4-5days for the nest to be constructed (Johnsgard 1979). The first egg is typically laid 1-2 days after the nest is constructed. Both sexes will incubate but only the female has a brood patch (Johnsgard 1979). The incubation time is 14 days (Baicich and Harrison 2005).

Figure 25. Bell's Vireos typically nest in thickets. Photo by Phillip Leonard.

Four eggs are typically laid, but sometimes clutches range from 3-5 eggs, subelliptical in shape and 17 mm long. They are smooth and not glossy in texture. They are white with specks of brown or black (Baicich and Harrison 2005). Some eggs are pure white (Bent 1950).

Nestlings remain in the nest for 9-12 days (Johnsgard 1979). Nestlings are downy and altricial after hatching. The young will remain with the parents for 25-30 days after fledging (Baicich and Harrison 2005). If nests are destroyed, Bell's Vireos will typically renest (Kus 1998. Bell's Vireos will sometimes have two broods but this is rare (Johnsgard 1979, Kus 1998.

Wintering

The wintering foods for this species are not well understood at this time (Kus et al. 2010). On its wintering grounds this species can be found in mixed-species flocks in arid to semihumid scrub (Howell and Web 1995).

Habitat

Breeding

This species' breeding habitat consists of thickets, often near streams or rivers (Johnsgard 1979). The presence of water is an important component of suitable habitat (Barlow 1962). They can also be found in second-growth scrub, forest edges and brush (Johnsgard 1979). In Oklahoma, Bell's Vireos nested in Chickasaw plum (*Prunus angustifolia*) with an average age of 7 years (Dunkin and Guthery 2010). Fencerows and roadsides are known to provide good habitat for this species (Busby and Zimmerman 2001). Another favored habitat is understory scrub (Averill-Murry and Corman 2005). Nesting may occur at any successional stage, as long as a dense understory component is present (Kus et al. 2010).

Their preferred nesting trees are rough-leaved dogwood (*Cornus drummondi*), wild plum (*Prunus* spp.), honey locust (*Gleditsia triacanthos*), smooth sumac (*Rhus glabra*) and mesquite (*Prosopis* spp.; Busby and Zimmerman 2001, Baicich and Harrison 2005). Cottonwood (*Populus* spp.) woodlands are preferred in the Northern Great Plains (Rumble and Gobeille 2004). Bell's Vireo can also be found in green ash (*Fraxinus pennsylvanica*) woodlands in South Dakota

(Rumble and Gobeille 1998). Willows (*Salix* spp.) are also commonly associated with Bell's Vireo habitat (Bent 1950, Oberholser 1974, Byre 2004).

This species is largely absent in intensely cultivated areas, pure grasslands and desert scrub (Kus et al. 2010). They also rarely occur at altitudes higher than 1,300m in the U.S. and 1,900m in Mexico (Kus et al. 2010).

Migration

During migration, this species is found in brush, open woods and coastal scrub (Oberholser 1974, Kus et al. 2010).

Winter

The wintering habitat of Bell's Vireo includes riparian and upland vegetation (Kus et al. 2010). Wintering habitat is often more arid than breeding habitat, but has a similar vegetation structure (Edwards 1989).

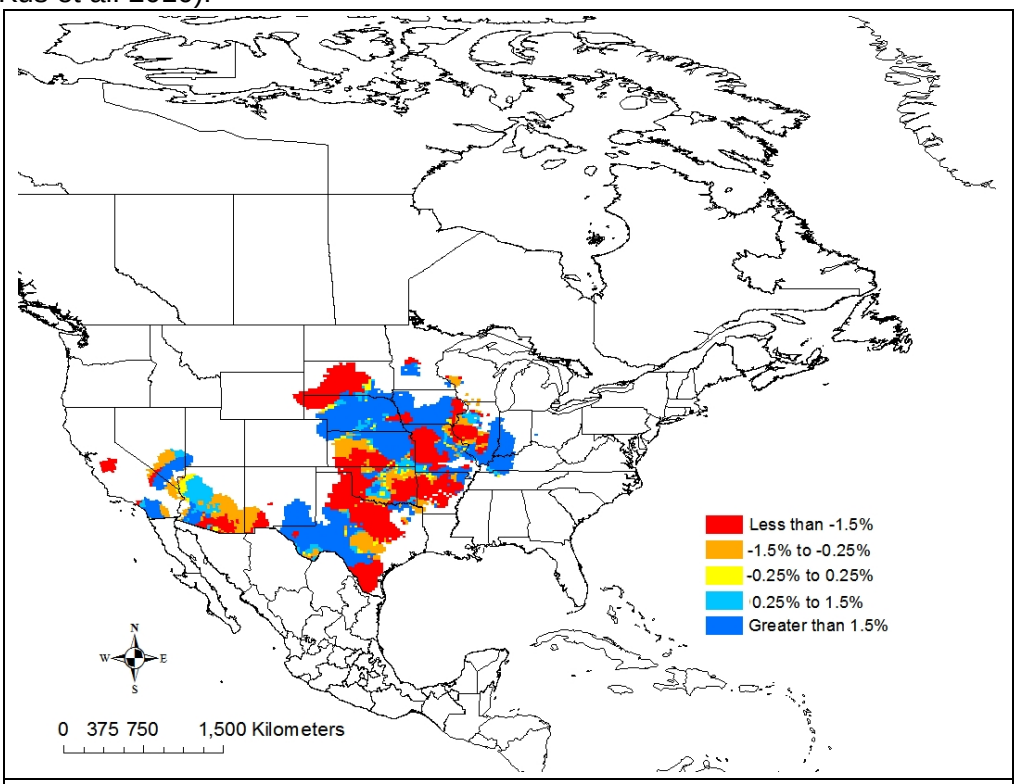

Figure 26. Map of percent change per year in the number of Bell's Vireos detected during the Breeding Bird Survey (BBS) for the period 1966 – 2012 from Sauer et al. (2014). Populations in the southern Great Plains are generally declining, while more northerly populations are generally increasing.

Population Trends and Estimates

Partners in Flight (2014) estimated that the population consisted of 4,600,000 individuals globally, with 3,600,000 individuals in the U.S.. Breeding Bird Surveys for the period 1966 – 2012 do not show a significant trend rangewide. Within Region 6, Bell's Vireos increased at a rate of 2.1% per year during this period, and increased at a rate of 3.5% per year for the period 2000-2012. The number of birds detected in Nebraska during 1966-2012 increased at a rate of 3.7% per year. No trend is apparent in the number of birds reported per party-hour during Christmas Bird Counts for the period 1966-2012 ($F_{1,45} = 0.43$, $R^2 = -0.007$). However, the number of birds reported each year was only 10.1 ± 1.7 individuals with a range of 0-64 individuals. The number of counts reporting this species averaged only 4.1 ± 0.4 counts, but a significant increase in the number of reporting counts during the period 1966-2012 was noted, perhaps reflecting increasing observer effort or skill ($F_{1,45} = 55.33$, $p < 0.001$).

Threats

Habitat Loss

Bell's Vireo abundance is strongly affected by anthropogenic modification (Kus et al. 2010). Habitat for this species has been lost due to agriculture, urbanization, firewood cutting, grazing, flood control projects and reservoir construction. Spring water releases from reservoirs

can result in the loss of downstream low-lying vireo nests (Kus et al. 2010). Wildfires also pose a threat to Bell's Vireos, as increased fire frequency has been shown to result in decreased abundances (Powell 2008). Agriculture, livestock grazing, and firewood cutting are also a threat to the wintering ground habitat (Kus et al. 2010).

Brood Parasitism

The Brown-headed Cowbird (*Molthrus ater*) parasitizes nests of Bell's Vireo throughout its range. The rates of parasitism vary geographically and through time, but is apparently neither increasing nor decreasing (Kus et al. 2010). Nests are usually parasitized during the egg-laying period. Cowbirds lay eggs close to sunrise in the nests of Least Bell's Vireo (Sharp and Kus 2004). Budnik et al. (2001) found that 58% of parasitized nests were deserted in Missouri. Desertion increases as the number of cowbird eggs per nest increases. Damage caused by cowbirds to host eggs reduces the hatch rate of vireo eggs (Kus et al. 2010). Unparasitized nests have been shown to produce more than three times the number of fledglings per egg compared to parasitized nests in Oklahoma (Wiens 1963). Budnik et al. (2001) found that the probability of parasitism decreased with increasing nest concealment, increasing shrub cover, and increasing patch size.

Pesticides

High levels of DDE have been reported in Least Bell's Vireo (*Vireo bellii pusillus*) eggs (Kus et al. 2010), but thinning has not been measured at this time (Kus et al. 2010).

Effects of Climate Change

The sensitivity score for Bell's Vireo was not assessed by the Climate Change Sensitivity Database (Tomasevic 2010).

Effects of Energy Development

The effects of energy development have not been well-studied for this species. Meehan et al. (2010) suggest that increased biofuel production of corn and soybeans will lead to decreases in Bell's Vireo populations.

Management

This species benefits from habitat heterogeneity. Bell's Vireo is a shrub-dependent species, and annual burning reduces the number of shrubs that are present in prairie habitats. Burning fields every four years results in increased habitat heterogeneity and increased abundances in Bell's Vireo (Powell 2008). Cowbird removal reduces nest parasitism rates of Least Bell's Vireo nests (Kosciuch and Sandercock 2008).

Conservation

Conservation efforts, for the endangered Least Bell's Vireo, have focused on cowbird control and habitat restoration (Kus et al. 2010). Existing habitat should be protected and degraded habitat should be restored through the removal of exotic species. In several projects for Least Bell's Vireos, cowbirds have been trapped and removed from riparian areas and cowbird eggs have been removed from vireo nests (Beezely and Rieger 1987, U.S. Fish and Wildlife Service 1998, Griffith and Griffith 2000). Trapping cowbirds has been shown to reduce the incidences of brood parasitism (Morrison and Averill-Murray 2002).

Completed and Ongoing Conservation Actions

Least Bell's Vireo is listed as federally and state endangered in the state of California (Kus et al. 2010). Efforts to restore riparian areas benefit this species (Kus 1998, Howell et al.

2010). Experiments with cowbird removal reduced parasitism of Bell's Vireo nests by up to five times when compared to non-treated areas (Kosciuch and Sandercock 2008).

TABLE 13. Bell's Vireo status rangewide summarized by multiple listing agencies. IUCN is an abbreviation for "International Union for Conservation of Nature" and data comes from IUCN (2014), ABC is an abbreviation for "American Bird Conservancy" and data is from ABC (2012), and "PIF" is an abbreviation for "Partners in Flight" and data comes from PIF (2014). A hyphen (-) indicates a lack of data. For the ABC Conservation Assessment, "Secure" species have no immediate conservation issues, "Potential Concern" species have smaller populations or ranges or at higher rates of population declines, "Vulnerable" species deserve conservation attention, and "At Risk" species need more urgent conservation attention. The "Birds of Conservation Concern" row shows the Bird Conservation Regions (BCR) and US Fish & Wildlife Region where this species is considered to be of conservation concern (USFWS 2008).

IUCN	Near Threatened
Federal listing	No, but subspecies Least Bell's Vireo (*Vireo bellii pusillus*) is endangered.
ABC Conservation Assessment	Vulnerable
Birds of Conservation Concern	BCR 18, BCR 19, BCR 21, BCR 22, BCR 24, BCR 33, BCR 34, BCR 35, BCR 36, USFWS Region 2, USFWS Region 3, USFWS Region 6, USFWS Region 8, National
PIF	U.S. – Canada Concern Species

TABLE 14. Bell's Vireo status summarized by Natural Heritage rankings, BBS trends for 1966 – 2012, BBS trends for 2000 – 2012, and multiple listing agencies. SGCN=Species of Greatest Conservation Need. A hyphen (-) = lack of data. For the natural heritage rankings, G = global and S = state, where S5 = secure (common, widespread, abundant, and lacking major threats or long-term concerns), S4 = apparently secure (uncommon but not rare, but with some cause for long-term concern, usually having more than 100 occurrences and 10,000 individuals), S3 = Vulnerable (rare; typically having 21 – 100 occurrences, or 3,000 – 10,000 individuals), S2 = Imperiled (typically having 6 – 20 occurrences, or 1,000 – 3,000 individuals), and S1 = Critically imperiled (typically having five or fewer occurrences, or 1,000 or fewer individuals). Natural Heritage rankings are only for breeding populations. For the BBS trends, data with an important deficiency are labeled as "Insufficient data". The BBS trends are annual changes. Numbers in parentheses are 95% confidence intervals.

	Natural Heritage Ranking	BBS Trend (1966 – 2012)	BBS Trend (2000 – 2012)	State Listing	SGCN
Rangewide	-	Insufficient data	Insufficient data	-	-
Region 6	-	2.1% (1.1, 3.1%)	3.6% (1.6, 6.0%)	-	-
Montana	-	-	-	-	-
North Dakota	S3	-	-	-	-
South Dakota	S4B	-0.2% (-4.1, 4.0%)	-1.2% (-13.8, 8.8%)	-	-
Wyoming	-	-	-	-	-
Colorado	S1B	-	-	-	-
Utah	-	-	-	-	Tier III
Nebraska	S4	3.7% (1.3, 6.3%)	5.4% (0.1, 12.4%)	-	Tier I
Kansas	S4B	1.5% (0.4, 2.7%)	2.8% (-0.5, 6.3%)	-	Tier I

McCown's Longspur (*Rhynchophanes mccownii*)

Figure 27. Breeding McCown's Longspurs are restricted to shortgrass prairies and overgrazed pastures from northern Colorado to southern Canada. Photo by Glenn Bartley / All Canada Photo / Universal Images Group.

Summary

- During the breeding season, male McCown's Longspurs have an obvious rusty patch on the wing, a black crown, and a black patch on the chest. During the non-breeding season, male McCown's Longspurs are brown above, streaked with darker brown, and are lighter brown below, with a remnant rusty patch remaining on the wing. Throughout the year, the tail is largely white.
- McCown's Longspurs breed from northern Colorado to southern Saskatchewan and southern Alberta. They were formerly more widespread, breeding east to Minnesota and south to Oklahoma. McCown's Longspurs winter from the Oklahoma Panhandle south to northern Mexico.
- The population is estimated to consist of 600,000 individuals. McCown's Longspurs are considered to be a Level I / Tier I species in Colorado, Kansas, and Nebraska, and are a Tier II species in Montana and Wyoming.
- Christmas Bird Count data suggest that the number of McCown's Longspurs per party-hour is declining at a rate of 0.05% per year. Rangewide, BBS data suggest that McCown's Longspurs are declining at a rate of 4.2% annually. This species has apparently been declining since approximately 1900.

Legal Status

The Migratory Bird Treaty Act (MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA protects any migratory bird under 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Status rangewide is summarized by Tables 15 and 16.

Description

During the breeding season, males are gray with a black bill, crown, malar stripe and upper breast (Fig. 27). They also have chestnut-colored median coverts. In addition, the lower breast and belly have a blackish wash. In contrast females lack the black plumage of males and are gray in color. Their bill is pale and they have rusty median coverts and scapulars. Non-breeding males appear similar to females, but their black crown appears spotted. There is often faint black spotting on the belly and they retain some of the dark breast patch. Their median coverts and scapulars are more chestnut than those of females (With 2010).

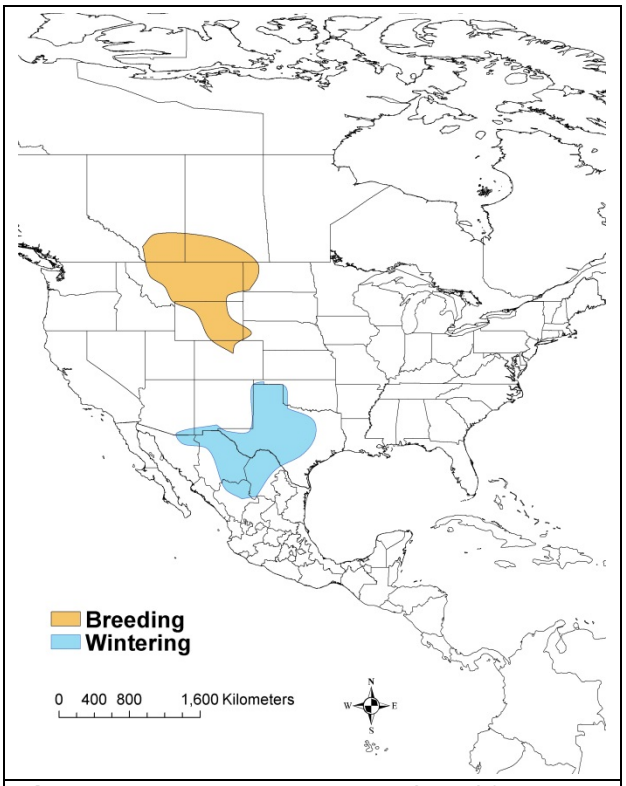

Figure 28. McCown's Longspurs breed from western North Dakota north into Saskatchewan, west to Alberta, and south to northern Colorado. They winter from eastern Colorado south to Durango and east to western Oklahoma and Texas. This map was created using data provided by BirdLife International and NatureServe (2012).

Distribution

Rangewide

This species breeds in the northwest Great Plains and southern Canada (Fig. 28). The breeding population of this species is disjunct. One population is present in north central Colorado to Wyoming, western Nebraska, and southwest South Dakota. The second population is present in central Montana, southern Alberta and Saskatchewan. It also extends into North Dakota and South Dakota (With 2010, Godfrey 1966, Rising 1996).

McCown's Longspur winters from central Arizona to eastern Colorado, western Kansas, and western Oklahoma. The winter range then extends through south central Texas into Sonora, Chihuahua, Coahuila and Durango (Rising 1996). Fluctuations in the winter distribution of this species are thought to be due to weather patterns and conditions on the wintering grounds (Sedgwick 2004).

Region 6

Colorado: McCown's Longspur are common to abundant breeding birds in the shortgrass prairies and overgrazed pastureland of northern Weld County and northeastern Larimer in northern Colorado. They also occur during summer in east-central Colorado in Washington, Elbert, Lincoln, and Kit Carson Counties (Andrews and Richter 1992, Kingery 1998).

Kansas: In western Kansas, McCown's Longspurs are considered to be uncommon to rare transients, and sporadic winter residents; they are casual in eastern Kansas (Thomson et al. 2011).

Montana: Breeding McCown's Longspurs can be found across much of the state, excluding the western one-fourth of the state. The greatest densities are in the central and northern portions of the state (Montana Bird Distribution Committee 2012, Montana Field Guide 2014).

Nebraska: McCown's Longspurs are uncommon migrants in western Nebraska, but are rare to casual elsewhere (Sharpe et al. 2001). During the Breeding Bird Atlas, this species was only found in the western Panhandle, in Sioux and Kimball counties (Molhoff 2001).

North Dakota: McCown's Longspurs are locally uncommon during spring, summer and fall (Faanes and Stewart 1982). They are fairly common in the eastern half of Divide County; fairly common locally in Burke County, Williams County, McKenzie County and Bowman County; and uncommon in Ward County, Billings County, Slope County and Hettinger County. They are rare and local everywhere else in the state (Stewart 1975).

South Dakota: This species is considered to be a casual migrant and an accidental summer visitor to the far northwest and southwest corners of the state (Tallman et al. 2002). The McCown's Longspur was last confirmed breeding in South Dakota in 1910 but is annual, albeit local, in northwestern South Dakota (Sedgwick 2004). During the Breeding Bird Atlas, birds were observed in Harding County but breeding was not confirmed (Peterson 1995).

Utah: McCown's Longspurs are accidental in Utah (Utah Bird Record Committee 2014).

Wyoming: This species is a common summer resident in the eastern portion of the state in the shortgrass prairies. There are few reports to the western half of the state (Faulkner 2010).

Biology

General

Seeds, insects and other arthropods are the main foods eaten by this species. McCown's Longspurs forage on the ground while walking or running (With 2010). They do not hop (Green et al. 2009). Their flight is undulating and McCown's Longspurs engage in aerial displays which involve hovering over the nest. Agonistic behavior is common between territorial males (With 2010). Territorial males will fly up to each other and flap their wings at each other when one male encroaches on another's territory (Mickey 1943). Females are also known to be active in territory or mate defense (With 2010).

The male's song is described as "see, see, see me, see me, hear me, hear me, see" and has a tinkling quality. Males do not sing on the wintering grounds or during migration (Oberholser 1974, With 2010). The songs are used when establishing territories (Mickey 1943) and males stop singing at the end of the breeding season (With 2010).

Eggs and nestlings are frequently lost to mammalian predators (With 2010). Approximately half of the nests in one study were depredated by thirteen-lined ground squirrels (*Spermophilus tridecemlineatus*), and predation was 2 –to 3 times greater for McCown's Longspurs that nested near a shrub (With 1994). Other known predators include Richardson's ground squirrel (*S. richardsonii*), Wyoming ground squirrel (*S. elegans*), white-tailed prairie dog (*Cynomys leucurus*), badger (*Taxidea taxus*), striped skunk (*Mephitis mephitis*), red fox (*Vulpes vulpes*), swift fox (*V. velox*), coyote (*Canis latrans*), and long-tailed weasel (*Mustela frenata*; DuBois 1937, Mickey 1943, Greer and Anderson 1989).

Breeding

The breeding season begins in early to mid-May (Baicich and Harrison 2005). Pairs form after males have established their territories (With 2010). McCown's Longspur nests are small depressions in the ground and are made of coarse grasses, lined with finer grasses, fur, hair, and wool (Godfrey 1966, Baicich and Harrison 2005). Females gather the nesting material and dig the depression for the nest (Johnsgard 1979).

Typically, 3-5 eggs are laid (Godfrey 1966). The eggs are pale buff or olive, grayish-white in color, with blotches of olive-brown, brown, blackish or lilac and are 20 x 15 mm (Baicich and Harrison 2005). The egg shape is typically oval, but a few elliptical eggs have been reported (Mickey 1943). The eggs are laid one per day. Incubation is done solely by the female and lasts 12-13 days (Baicich and Harrison 2005). The female also will do most of the brooding (Johnsgard 1979).

After hatching, nestlings are altricial and downy. Both parents care for the young (Baicich and Harrison 2005). The eyes of recently hatched birds remain closed for two days (Mickey 1943). The young are able to leave the nest at 10 days old, and can fly at 12 days. McCown's Longspurs will often double brood (Baicich and Harrison 2005). The breeding season ends by early August (Baicich and Harrison 2005).

Wintering

During the winter, the McCown's Longspur become more granivorous (Grzybowski 1982). Knotweed (*Polygonum* spp.), sunflower (*Helianthus* spp.), goosefoot (*Chenopodium album*), and needlegrass (*Nassella leucotricha*) seeds are eaten as well as grain. Berries are also eaten in the winter (Oberholser 1974). They can be found in flocks with other longspurs and Horned Larks (Rising 1996).

Habitat

Breeding

McCown's Lonspurs breed in the semi-arid shortgrass steppe of the Central Plains and Canadian Prairie Provinces. This habitat is open and has sparse vegetation. This species prefers habitat with a mix of perennial shortgrass species (*Bouteloua gracilis*, *Buchloe dactyloides*), some cactus (*Opuntia polyacantha*), small amounts of midgrasses (*Aristida longiseta*) and some shrubs

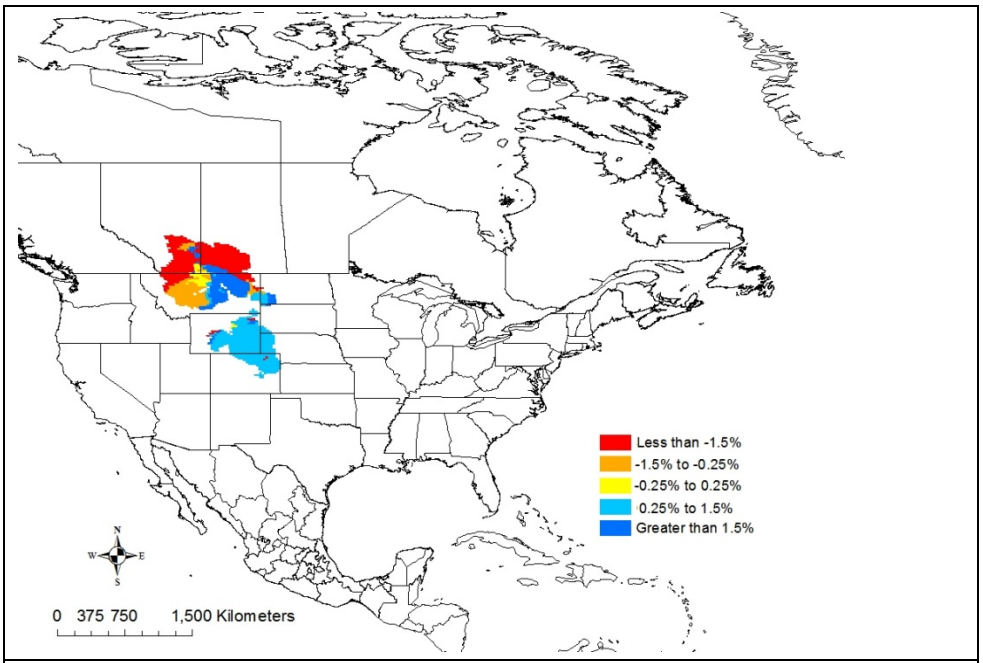

Figure 29. Map of percent change per year in the number of McCown's Longspur detected during the Breeding Bird Survey (BBS) for the period 1966-2012 from Sauer et al. (2014). The slight increases shown on the map are not statistically significant and overall this species is declining at a rate of 4.2% per year.

(With 2010). Densities are higher in areas occupied by black-tailed prairie dogs (*Cynomys ludovicianus*; Augustine and Baker 2013).

Migration

There is little known about the habitat and ecology of this species' migration (With 2010).

Winter

The winter habitat of McCown's Longspur consists of open habitats with sparse vegetation. This includes shortgrass prairie, overgrazed pastures, plowed fields and dry lakebeds (With 2010). The preferred vegetation height in the winter is less than 0.5 m (Grzybowski 1982). Playa wetlands in the Southern High Plains of Texas are known to attract feeding flocks of wintering McCown's Longspurs (Smith et al. 2004).

Population Trends and Estimates

Partners in Flight (2014) estimated that the population consisted of 600,000 individuals globally, with 400,000 individuals in the US. However, Wellicome et al. (2014) noted that McCown's Longspurs are less frequently encountered near roads and suggest that population estimates derived from BBS surveys may be underestimations. Breeding Bird Surveys for the period 1966-2012 show a significant annual decline of 4.2% (Fig. 29, Table 16). Likewise, the number of birds detected per party-hour on Christmas Bird Counts during the same period decline by 0.05% ($F_{1,45}$ = 17.81, R^2 = 0.27, p = 0.0001; Fig. 30).

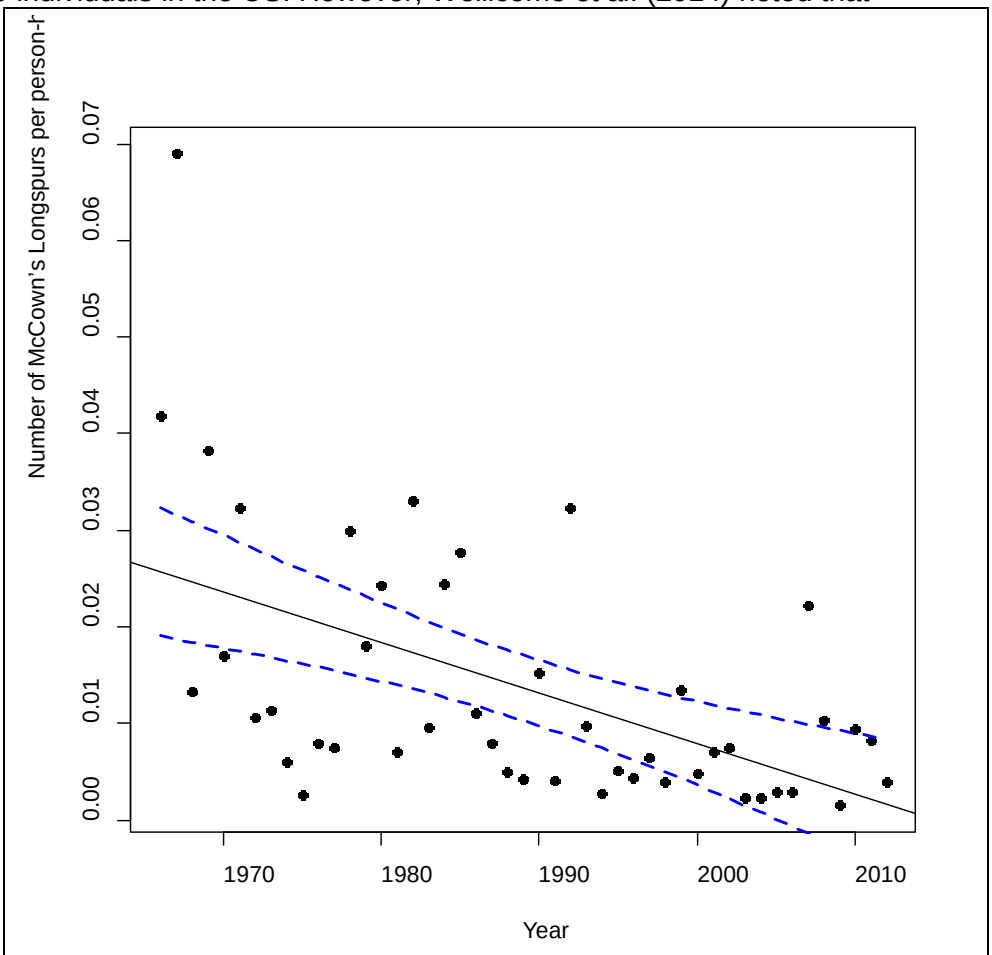

Figure 30. The number of McCown's Longspurs detected per party-hour during CBCs in the U.S. and Mexico for the period for the period 1966-2012 changed at a rate of -0.05% per year. Dashed lines indicate 95% confidence intervals. This figure was created using data from the National Audubon Society (2014).

Threats

Pesticides

The use of pesticides could have adverse effects on this species. Direct poisoning of longspur nestlings has been reported from the use of the insecticide toxaphene (MacEwen and Ells 1975).

Degradation of Habitat

Agriculture and development have reduced the native shortgrass prairie (With 2010). For example, Wyoming has lost 12.1% of its shortgrass prairie, Colorado lost 30.7%, Nebraska lost 65.4%, and Kansas lost 78% (Knopf and Rupert 1999). The continued loss of habitat may be detrimental to this species (Sedgwick 2004).

Effects of Climate Change

McCown's Longspur was not assessed by the Climate Change Sensitivity Database (Tomasevic 2010). This species is susceptible to reductions in clutch size due to extremes in weather. These reductions rarely result in total nest failure (With 2010). Changing weather patterns could result in this species having a lower nest success rate (Sedgwick 2004).

Effects of Energy Development

The effects of energy development on this species are not well understood at this time. Sedgwick (2004) suggests that habitat loss to energy development may adversely affect this species. The cumulative footprint of energy development in the western U.S. may exceed 20.6 million hectares by 2030 (McDonald et al. 2009) and energy development could directly or indirectly affect up to 18% of the land area in western North America (Copeland et al. 2011).

Management

More research will be needed to better understand how to manage for this species. Sedgwick (2004) suggests that prairie management should rely upon grazing and fire to maintain suitable conditions for this species.

Conservation

The loss of grassland habitat makes understanding the effects of grazing intensity, fire, pesticide application, and tillage-type a research priority for this species (With 2010).

Completed and Ongoing Conservation Actions

No conservation actions have been taken for this species (With 2010).

TABLE 15. McCown's Longspur status rangewide summarized by multiple listing agencies. IUCN is an abbreviation for "International Union for Conservation of Nature" and data comes from IUCN (2014), ABC is an abbreviation for "American Bird Conservancy" and data is from ABC (2012), and "PIF" is an abbreviation for "Partners in Flight" and data comes from PIF (2014). A hyphen (-) indicates a lack of data. For the ABC Conservation Assessment, "Secure" species have no immediate conservation issues, "Potential Concern" species have smaller populations or ranges or at higher rates of population declines, "Vulnerable" species deserve conservation attention, and "At Risk" species need more urgent conservation attention. The "Birds of Conservation Concern" row shows the Bird Conservation Regions (BCR) and US Fish & Wildlife Region where this species is considered to be of conservation concern (USFWS 2008).

IUCN	Least Concern
Federal listing	No
ABC Conservation Assessment	Vulnerable
Birds of Conservation Concern	BCR 10, BCR 11, BCR 17, BCR 18, BCR 19, BCR 20, BCR 35, USFWS Region 2, USFWS Region 6, National
PIF	Not a U.S. – Canada Concern Species

TABLE 16. McCown's Longspur status summarized by Natural Heritage rankings, BBS trends for 1966 – 2012, BBS trends for 2000 – 2012, and multiple listing agencies. SGCN=Species of Greatest Conservation Need. A hyphen (-) = lack of data. For the natural heritage rankings, G = global and S = state, where S5 = secure (common, widespread, abundant, and lacking major threats or long-term concerns), S4 = apparently secure (uncommon but not rare, but with some cause for long-term concern, usually having more than 100 occurrences and 10,000 individuals), S3 = Vulnerable (rare; typically having 21 – 100 occurrences, or 3,000 – 10,000 individuals), S2 = Imperiled (typically having 6 – 20 occurrences, or 1,000 – 3,000 individuals), and S1 = Critically imperiled (typically having five or fewer occurrences, or 1,000 or fewer individuals). Natural Heritage rankings are only for breeding populations. For the BBS trends, data with an important deficiency are labeled as "Insufficient data". The BBS trends are annual changes. Numbers in parentheses are 95% confidence intervals.

	Natural Heritage Ranking	BBS Trend (1966 – 2012)	BBS Trend (2000 – 2012)	State Listing	SGCN
Rangewide	G4	-4.2% (-7.1, -1.3%)	1.1% (-3.4, 6.8%)	-	-
Region 6	-	-1.0% (-3.2, 1.5%)	1.8% (-1.3, 6.2%)	-	-
Montana	S3B	-1.8% (-5.0, 1.4%)	2.5% (-3.3, 13.2%)	Species of Concern	Tier II
North Dakota	S2	-	-	-	Level III
South Dakota	SUB	-	-	-	-
Wyoming	S2	-0.6% (-5.1, 4.4%)	0.1% (-6.5, 8.9%)	-	Tier II
Colorado	S2B	Insufficient data	Insufficient data	-	Species of Greatest Conservation Concern
Utah	-	-	-	-	-
Nebraska	S3	-	-	-	Tier I
Kansas	S3N	-	-	-	Tier I

Vesper Sparrow (*Pooecetes gramineus*)

Figure 31. Vesper Sparrows will often continuing singing until after the sun has set. Photo by Glenn Bartley / All Canada Photo / Universal Images Group.

Summary

- Vesper Sparrows are relatively large sparrows that are brown and streaky above, with the streaks extending to the chest and along the sides of the cream-colored belly. They are similar to Savannah Sparrows but have a white eyering and white outer tail feathers. Vesper Sparrows were named for their tendency to sing through the evening.
- Vesper Sparrows breed from Nova Scotia to British Columbia, south to California, New Mexico, and western North Carolina. Individuals typically winter in areas where the minimum January temperature exceeds 1°C. This extends from South Carolina, west to California, and south to southern Mexico.
- The population is estimated to consist of 28 million individuals. Vesper Sparrows are considered to be a Level I / Tier I species in Colorado.
- The number of Vesper Sparrows per party-hour on Christmas Bird Counts in the U.S. and Mexico are declining at a rate of 0.1% per year. Breeding Bird Survey data for the period 1966-2012 show that Vesper Sparrows are declining at a rate of 0.9% annually. Within Region 6, Vesper Sparrows declined at a rate of 0.7% annually for the period 1966-2012. Significant declines were noted in Montana (-1.1% annually) and Wyoming (-1.2% annually).

Legal Status

The Migratory Bird Treaty Act (MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA protects any migratory bird under 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Status rangewide is summarized by Tables 17 and 18.

Description

The Vesper Sparrow is a large sparrow (Fig. 31). They are 15 cm in length and weigh 24.7 g. This species has a small conical bill. Vesper Sparrows are grayish brown above and white below. The underparts are streaked black and brown. Although Vesper Sparrows superficially resemble Savannah Sparrows (*Passerculus sandwichensis*), they have a narrow white eyering, and pale ear-coverts with a dark border. In addition, the outer tail feathers are white and the lesser wing-coverts are rufous. The juveniles appear similar to the adults, but their lesser wing-coverts lack much of the rufous color. The plumages of Vesper Sparrows are similar throughout the year and both sexes are similar. In the spring and summer, the plumage is more grayish and streaking is more distinctive (Jones and Cornely 2002).

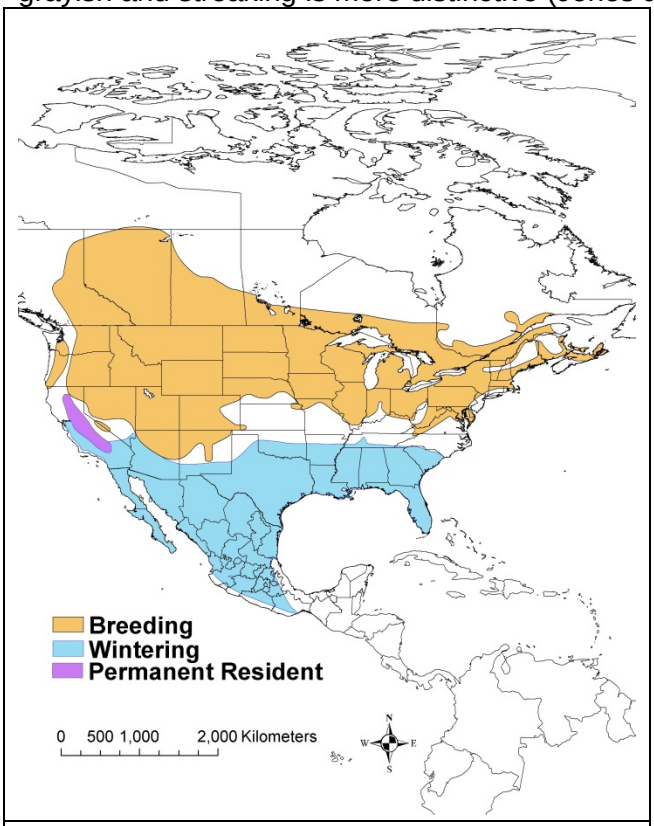

Figure 32. Vesper Sparrows breed from Nova Scotia west to British Columbia and south to New Mexico and northeastern Tennessee. They winter from California to South Carolina and south to southern Mexico. This map was created using data provided by BirdLife International and NatureServe (2012).

Distribution

Rangewide

These sparrows breed from eastern British Colombia to Nova Scotia south to California, central New Mexico, southwestern Kansas, southern Illinois, northeastern Tennessee and western Virginia (Jones and Cornely 2002; Fig. 32). They generally winter south of the 1°C January minimum isotherm (Root 1988). Vesper Sparrows winter from California east through Oklahoma, to South Carolina and south to southern Mexico (Howell and Webb 1995, Jones and Cornely 2002).

Region 6

Colorado: Vesper Sparrows are found throughout the entire state during migration. Breed occurs mostly in the mountains, western plateaus, and valleys of western Colorado (Andrews and Righter 1992, Kingery 1998).

Kansas: Vesper Sparrows are a common to abundant migrant throughout the state (Thomson et al. 2011). Vesper Sparrows are rare and local during the breeding season in the far southwestern (Morton County) and far northeastern (Brown and Doniphan Counties) portions of the state. This species is probably overlooked as a breeding species in Kansas (Busby and Zimmerman 2001). Vesper Sparrows are casual in Kansas during winter (Thomson et al. 2011)

Montana: Breeding Vesper Sparrows are found throughout Montana (Montana Bird Distribution Committee 2012, Montana Field Guide 2014).

Nebraska: Vespers Sparrows are common spring and fall migrants statewide. They are common during the breeding season in the north and northwest, but are uncommon in the east and are rare elsewhere (Sharpe et al. 2001). They may be under-reported and overlooked in Nebraska (Molhoff 2001).

North Dakota: Vesper Sparrows are fairly common migrants and locally common during the summer (Faanes and Stewart 1982). They are common throughout most of the state but are less common in the Turtle Mountains, Southern Drift Plain, Coteau Slope, and Missouri Slope (Stewart 1975). Vesper Sparrows are occasional in winter (Faanes and Stewart 1982).

South Dakota: Vesper Sparrows are common migrants and summer residents in eastern and western South Dakota, but are markedly less common in central South Dakota (Peterson 1995, Tallman et al. 2002).

Utah: Vesper Sparrows are considered common summer residents and are rare during the winter (Utah Conservation Data Center 2013, Utah Bird Record Committee 2014). Winter birds are restricted to southwestern Utah (Jones and Cornely 2002).

Wyoming: This species is a common resident in the summer. They can be found throughout the state and are more abundant in the lowlands (Faulkner 2010).

Biology

General

Invertebrates, insects, spiders (Arachnida), beetles (Coleoptera), grasshoppers (Orthoptera), and caterpillars (Lepidoptera) are the primary food taken during the breeding season. Waste grain, grass seeds and weed seeds are eaten throughout all seasons (Bent and Austin 1968). They glean the foliage of low plants and can be seen hovering around taller vegetation to prey upon insects. Vesper Sparrows will use a rapid pecking movement to capture food (Rodenhouse and Best 1994). They also vigorously scratch the ground with both feet to feed on seeds (Taylor 1970, Rodenhouse and Best 1994). They are also known to take frequent dust baths (Bent and Austin 1968).

During migration and winter, these sparrows can be found in small, loose flocks. They will perch in a nearby tree or bush after they are flushed (Rising 1996). When in flight, flashes of white on the tail feathers are easily observed (Oberholser 1974). Vesper Sparrows can be found nesting and foraging near other sparrow species without conflict (Bent and Austin 1968).

The song of the Vesper Sparrow is similar to that of the Song Sparrow (*Melospiza melodia*). Their song begins with two long clear notes with downward slurs. This is followed by shorter trills that rise and fall in pitch. They rarely make flight calls (Rising 1996) but do occasionally engage in extended flight songs (Wells and Vickery 1994). The Vesper's Sparrows' call is a sharp *chrip* (Oberholser 1974).

Breeding

This species breeds in dry, short grass habitats that have scattered perches (Cadman et al. 2007). Vesper Sparrows construct their nests on the ground, in a depression of short grasses (Jones and Cornely 2002). The female is responsible for nest construction, and nests are woven cups of grasses with a shallow bowl (Rising 1996, Cadman et al. 2007). Both parents will

incubate and care for the young but only the female has a brood patch (Rising 1996, Jones and Cornely 2002).

One egg is laid each day (Jones and Cornely 2002). Females may lay 2-5 eggs per brood but typically lay 3-4 creamy white or greenish white eggs, with brownish spots (Rising 1996). Eggs are incubated for 12-13 days (Jones and Cornely 2002). The young leave the nest at 9-13 days. When they leave, the young are unable to fly and the parents will look after the young for 20-22 days after they leave the nest (Semenchuk 1992). Vesper Sparrows have been known to double brood, with the male caring for the young while the female builds the second nest (Cadman et al. 2007).

Males will sing from conspicuous perches such as fence posts, shrubs or isolated trees. When predators are near the nest, Vesper Sparrows engage in the broken wing display. They will also attack predators. Their nests are often parasitized by Brown-headed Cowbird (Cadman et al. 2007).

Wintering

In winter, Vesper Sparrows can be found in flocks near cover, but they are typically solitary when foraging away from cover. Wintering individuals in Arizona can be found in small flocks of Grasshopper (*Ammodramus savannarum*), Savannah, and Baird's (A*. bairdii*) sparrows (Pulliam and Mills 1977). The home range size in Mexico ranged from 30 – 108 ha, although there was substantial overlap in home ranges among individuals (Macías-Duarte and Panjabi 2013).

Habitat

Breeding

Although they are a grassland-obligate species, Vesper Sparrows prefer to nest in areas that are a patchwork of bare ground or short vegetation with taller vegetation nearby (Sadoti et al. 2014). During the breeding season, Vesper Sparrows prefer open, weedy areas and prairie edges (Semenchuk 1992, Stewart 1975). In these areas, they are found in areas with thickets or

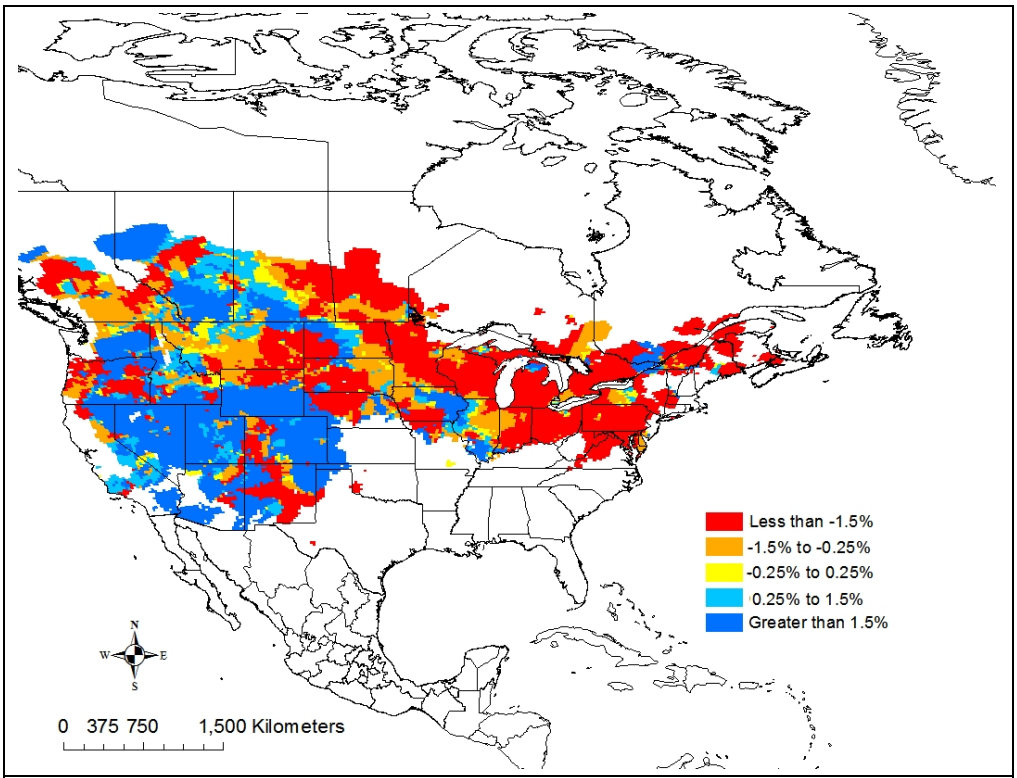

Figure 33. Map of percent change per year in the number of Vesper Sparrows detected during the Breeding Bird Survey (BBS) for the period 1966-2012 from Sauer et al. (2014). Vesper Sparrows are declining in the eastern portion of their range. Observed increases in western populations are not significant.

small trees and shrubs (Stewart 1975). They will also breed in cornfields and soybean fields, but are less successful in this habitat. Vesper Sparrows forage in or near fencerows, or in weedy areas within fields (Rodenhouse and Best 1994).

Migration

During migration, Vesper Sparrows are found in grasslands and open cultivated fields (Sharpe et al 2001).

Winter

In Mexico, this species is found in grasslands, weedy fields, brushy second growth, and the brushy borders of grasslands (Howell and Webb 1995). In Texas, Vesper Sparrows winter in the plains, prairies and savannas. They are also found in grassy pastures, fields, and woodland clearings (Oberholser 1974).

Population Trends and Estimates

Partners in Flight (2014) estimated that the population consisted of 28 million individuals, with 10 million individuals in Canada and 18 million in the U.S.. Breeding Bird Survey data suggests that Vespers Sparrows are declining at a rate of 0.9% annually (Fig. 33; Table 18). Within Region 6, Vesper Sparrows declined at a rate of 0.7% annually for the period 1966-2012. Significant declines were noted in Montana (-1.1% annually) and Wyoming (-1.2% annually). Data from Christmas Bird Counts in the U.S. and Mexico suggest that Vesper Sparrows are declining at a rate of 0.1% per year ($F_{1,45} = 6.74$, $R^2 = 0.11$, $p = 0.01$; Figure 34).

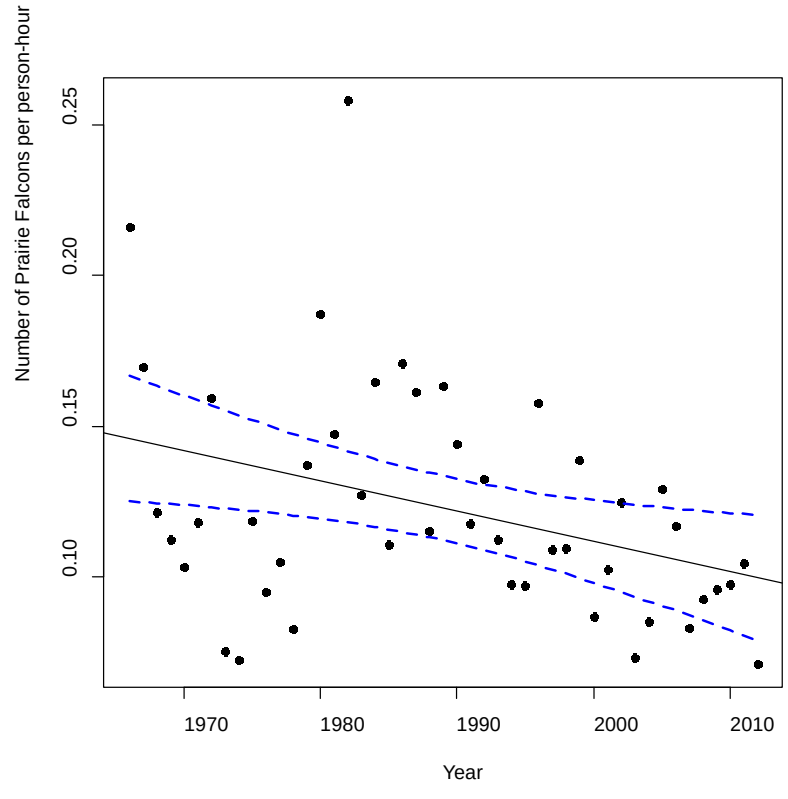

Figure 34. The number of Vesper Sparrows detected per party-hour during CBCs in the U.S. and Mexico for the period for the period 1966-2012 declined at a rate of 0.10% per year. Dashed lines indicate 95% confidence intervals. This figure was created using data from the National Audubon Society (2014).

Threats

Agriculture

Farming practices are a major factor contributing to nest loss in agricultural areas (Rodenhouse and Best 1983, Frawley and Best 1991, Bryan and Best 1994, Stallman and Best 1996). Tilling often results in nests being destroyed. Using no tillage farming practices reduces the number of nests that are destroyed in agricultural areas (Rodenhouse and Best 1983). While breeding does occur in agricultural areas, breeding success is not sufficient to maintain populations (Rodenhouse and Best 1983, Perritt and Best 1989, Stallman and Best 1996).

Pesticides

This species is thought to have a medium risk for pesticide exposures for 2-5 months per year (Boutin et al. 1999). In North Dakota, Lokemoen and Beiser (1997) found no difference in nesting success among fields that used pesticides and fields where pesticides were not used.

Mining

In the Northern Great Plains, mining affects populations (Schaid et al. 1983). The reduction of sagebrush habitat caused by mining limits available habitat. Reclaimed mined areas still showed reduced sparrow density. Reserving shrubby areas near mined areas could help to protect Vesper Sparrows near mining areas (Schaid et al. 1983).

Effects of Climate Change

The sensitivity score for Vesper Sparrow was not assessed by the Climate Change Sensitivity Database (Tomasevic 2010). Hitch and Leberg (2007) found that Vesper Sparrows did not significantly shift their breeding range north. Vesper Sparrows have decreased breeding success in drier years (Perritt and Best 1989). In addition, the winter distribution of this species correlates with the 1°C January minimum (Root 1988) and could conceivably shift north in response to warmer winters.

Effects of Energy Development

The destruction of sagebrush habitat by mining operations decreases Vesper Sparrow populations (Schaid et al. 1983, Gilbert and Chalfoun 2011).

Management

Giuliano and Daves (2002) found that warm-season grass fields support a greater abundance of Vesper Sparrows than cool-season grass fields. Vesper Sparrows found in warm-season grass fields also had a greater nest success and higher fledging rates. Breeding success could be improved for Vesper Sparrows by reducing the number of tillage operations and allowing crop residue to remain on fields (Rodenhouse and Best 1983).

Increasing available cover is also important for Vesper Sparrows. Grant et al. (2006) found that nest survival increases as the amount of cover increases. Consequently, restoring lost shrub habitat is an important management goal for this species (Schaid et al. 1983). Interestingly, the inclusion of 40,000 ha of grassland in Conservation Reserve Enhancement Program in Pennsylvania has not benefitted Vesper Sparrows, as populations in these areas have declined (Pabian et al. 2013). Indeed, Vesper Sparrows are more abundant in row-crop fields than in CRP fields (Patterson and Best 1996).

Conservation

More research is needed to fully understand what conservation measures should be taken for this species. Many of the current management recommendations are contradictory (Jones and Cornely 2002). Research into habitat requirements and management impact is needed to determine what measures should be taken as well as research to determine how nesting success is affected under different management regimes (Jones and Cornely 2002).

Completed and Ongoing Conservation Actions

No direct actions have been taken to address Vesper Sparrow status. Vesper Sparrows will benefit from increasing grassland easements and other grassland restoration projects (Jones and Cornely 2002).

TABLE 17. Vesper Sparrow status rangewide summarized by multiple listing agencies. IUCN is an abbreviation for "International Union for Conservation of Nature" and data comes from IUCN (2014), ABC is an abbreviation for "American Bird Conservancy" and data is from ABC (2012), and "PIF" is an abbreviation for "Partners in Flight" and data comes from PIF (2014). A hyphen (-) indicates a lack of data. For the ABC Conservation Assessment, "Secure" species have no immediate conservation issues, "Potential Concern" species have smaller populations or ranges or at higher rates of population declines, "Vulnerable" species deserve conservation attention, and "At Risk" species need more urgent conservation attention. The "Birds of Conservation Concern" row shows the Bird Conservation Regions (BCR) and US Fish & Wildlife Region where this species is considered to be of conservation concern (USFWS 2008).

IUCN	Least Concern
Federal listing	No
ABC Conservation Assessment	Potential Concern
Birds of Conservation Concern	Subspecies *P. g. affinis* is listed in BCR 5, USFWS Region 1.
PIF	Not a U.S. – Canada Concern Species

TABLE 18. Vesper Sparrow status summarized by Natural Heritage rankings, BBS trends for 1966 – 2012, BBS trends for 2000 – 2012, and multiple listing agencies. SGCN=Species of Greatest Conservation Need. A hyphen (-) = lack of data. For the natural heritage rankings, G = global and S = state, where S5 = secure (common, widespread, abundant, and lacking major threats or long-term concerns), S4 = apparently secure (uncommon but not rare, but with some cause for long-term concern, usually having more than 100 occurrences and 10,000 individuals), S3 = Vulnerable (rare; typically having 21 – 100 occurrences, or 3,000 – 10,000 individuals), S2 = Imperiled (typically having 6 – 20 occurrences, or 1,000 – 3,000 individuals), and S1 = Critically imperiled (typically having five or fewer occurrences, or 1,000 or fewer individuals). Natural Heritage rankings are only for breeding populations. For the BBS trends, data with an important deficiency are labeled as "Insufficient data". The BBS trends are annual changes. Numbers in parentheses are 95% confidence intervals.

	Natural Heritage Ranking	BBS Trend (1966 – 2012)	BBS Trend (2000 – 2012)	State Listing	SGCN
Rangewide	G5	-0.9% (-1.2, -0.6%)	-0.2% (-0.8, 0.4%)	-	-
Region 6	-	-0.7% (-1.1, -0.3%)	-0.4% (-1.1, 0.3%)	-	-
Montana	S5B	-1.1% (-2.0, -0.3%)	-0.1% (-1.9, 1.9%)	-	Tier III
North Dakota	SNRB	0.5% (-0.2, 1.2%)	0.3% (-1.5, 1.8%)	-	-
South Dakota	S5B	-0.9% (-2.0, 0.1%)	-3.4% (-7.0, -0.3%)	-	-
Wyoming	S5	-1.2% (-2.0, -0.4%)	-1.7% (-3.5, 0.1%)	-	-
Colorado	S5	-0.1% (-1.4, 1.1%)	-0.2% (-2.1, 1.8%)	-	Species of Greatest Conservation Concern
Utah	S5B, S2N	-1.2% (-2.6, 0.1%)	-1.3% (-3.5, 1.11%)	-	-
Nebraska	S5	1.9% (-0.8, 4.8%)	1.1% (-5.6, 8.5%)	-	-
Kansas	S2B	Insufficient data	Insufficient data	-	-

Bobolink (*Dolichonyx oryzivorus*)

Figure 35. This male Bobolink, photographed in Oklahoma, is in the process of molting into alternate (breeding) plumage. During the non-breeding season, male Bobolinks look like large sparrows. Photo by Bill Adams.

Summary:

- During much of the year, Bobolinks look like sparrows. Non-breeding males and females are generally a yellow-buff with bold stripes on the back. During the breeding season, males become jet black below, with a pale yellow nape, white scapulars, and a white rump. Boblinks typically sing while flying, a musical jumble of notes that brings to mind an old-fashioned music box.
- Bobolinks breed from Nova Scotia to British Columbia, south to Colorado and West Virginia. Isolated populations breed south to Arizona and North Carolina. Bobolinks winter in South America, from Bolivia and western Brazil south to northeastern Argentina.
- The population is estimated to consist of eight million individuals. Within Region 6, Bobolinks are listed as a Level I / Tier I species (i.e., a species in greatest conservation need) in North Dakota, Colorado, and Kansas. They are listed as a Level II / Tier II species (i.e., a species in need of conservation) in Wyoming and Utah.
- Breeding Bird Survey data for the period 1966-2012 show that Bobolinks are declining at a rate of 2.2% annually. In contrast, within Region 6, Bobolinks increased at a rate of 0.9% annually, driven by significant increases in North Dakota (1.1% annually) and Nebraska (1.9% annually).

Legal Status:

The Migratory Bird Treaty Act (MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA protects any migratory bird under 50 CFR 10.12. The Service maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines. Status rangewide is summarized by Tables 19 and 20.

Description

Bobolinks are medium-sized passerines exhibiting sexual dimorphism in breeding plumage. Alternate plumaged males are striking; they are black with white wing patches, a light gray back, buffy nape, and a dark bill (Fig. 35). Females resemble sparrows, but are larger, with a median crown stripe, yellow-buff belly, light bill, and dark back. Both sexes have elongated hind claws and pointed rectrices. Males in basic plumage and juveniles look similar to females. There are currently no recognized subspecies (Martin and Gavin 1995).

Distribution

Rangewide

Bobolinks breed in the northern United States and southern Canada. In Canada, Bobolinks breed from southern British Columbia to Newfoundland (Martin and Gavin 1995; Fig. 36). In the United States, Bobolinks can be found from Washington to Maine, and south to Colorado and Virginia (Martin and Gavin 1995). Small, isolated breeding populations occur in Nevada, Washington, Utah, Arizona, Kansas, Kentucky, and North Carolina (Martin and Gavin 1995), as well as a large isolated population in southeastern Oregon at Malheur National Wildlife Refuge (Wittenberger 1978).

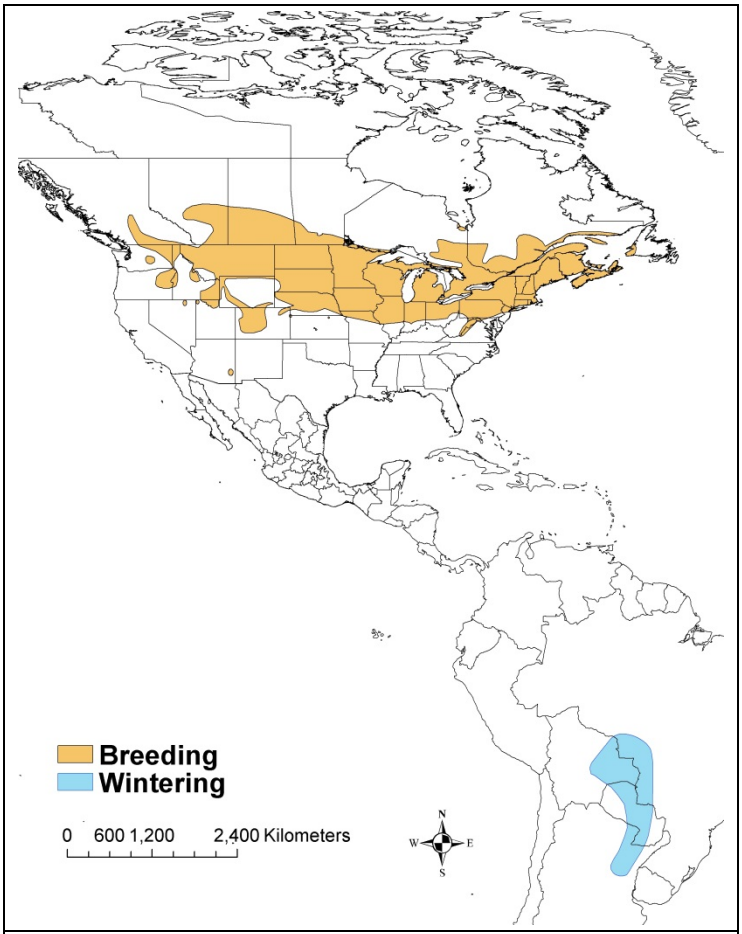

Figure 36. Bobolinks breed from Nova Scotia west to British Columbia and south to Colorado and West Virginia. They winter in Bolivia, Brazil, Paraguay, and Argentina. This map was created using data provided by BirdLife International and NatureServe (2012).

Bobolinks are long-distance migrants that winter in South America from Bolivia and southwest Brazil to northeast Argentina (Martin and Gavin 1995, Vickery et al. 2003, Di Giacomo et al. 2005). Bobolinks occur irregularly along the coast of Peru and northern Chile (Martin and Gavin 1995). There are also several records of Bobolinks in Europe during the spring and fall (Martin and Gavin 1995).

Region 6

Colorado: In Colorado, Bobolinks are found in irrigated hayfields with access to forbs. They breed primarily in the northwestern part of the state in

Moffatt, Routt, and Rio Blanco counties but are considered to be rare (Andrews and Righter 1992, Kingery 1998; Johnsgard 2011).

Kansas: Bobolinks breed locally in the summer and are migrants through east-central Kansas. They are sometimes reported in the western part of the state. Bobolinks are most often found during migration in May and October. Breeding birds have been documented in Barton, Cloud, and Stafford counties (Thompson et al. 2011). Nesting may occur at Cheyenne Bottoms Wildlife Area and Quivira National Wildlife Refuge, and possibly northeastern Kansas (Busby and Zimmerman 2001, Thompson et al. 2011).

Montana: Bobolinks are found throughout the state during the breeding season (Montana Bird Distribution Committee 2012), but they are a species of concern due to large population declines (Montana Field Guide 2014). Bobolinks frequent eastern and central Montana, near Medicine Lake NWR and Lee Metcalf NWR (Johnsgard 2011).

Nebraska: Bobolinks migrate regularly through Nebraska, but breed in the northern part of the state in the Sandhills, throughout the Platte Valley (Sharpe et al. 2001). They prefer wetland meadows during the breeding season (Molhoff 2001), but will utilize cattails during migration (Sharpe et al. 2001). Bobolinks arrive in Nebraska in early May and depart by September (Sharpe et al. 2001).

North Dakota: Bobolinks are fairly common in spring, summer, and fall in North Dakota (Faanes and Stewart 1982). They breed regularly in North Dakota in ungrazed to lightly grazed native prairie (Stewart 1975, Johnsgard 1979). Occasionally, they will nest in alfalfa fields and other cropland. Bobolinks nest from late May to mid-August (Stewart 1975).

South Dakota: Bobolinks are found fairly commonly in eastern South Dakota during the breeding season. They are uncommon in western South Dakota. They arrive in mid-May and depart by September (South Dakota Ornithologists' Union 1991, Peterson 1995, Tallman et al. 2002). They prefer ungrazed or lightly grazed prairie (Johnsgard 1979).

Utah: Bobolinks are rare summer residents (Utah Bird Records Committee 2014). Bobolink habitat in Utah is found primarily in the north-central and northeastern parts of the state (Ryser 1985), from Bear Lake to Kamas. Bobolinks arrive in early to mid-May and depart by September (Utah Conservation Data Center 2013).

Wyoming: Bobolinks are summer residents in Wyoming (Faulkner 2010). They migrate throughout the state, but breed locally, with the greatest concentrations in northeastern Wyoming in Crook County, the eastern Bighorn Mountains and the National Elk Refuge (Teton County; Faulkner 2010, Johnsgard 2011). They are patchily distributed in the western half of Wyoming and along the Platte River area (Faulkner 2010).

Biology

General

Bobolinks feed on insects, arachnids, and seeds during the breeding season (Martin and Gavin 1995). They forage at the tops of plants for seeds and glean for invertebrates near the base (Martin and Gavin 1995). Insects are important for nestling growth and development, and Bobolinks may preferentially collect lepidopterans (Skipper and Kim 2013). During migration and winter, they feed on rice, oats, and corn in both sprout and milk stages, seeds, and occasionally insects (Martin and Gavin 1995). Bobolinks generally swallow insects and seeds whole, and will often wipe their bill after eating (Martin and Gavin 1995).

Bobolink flight pattern involves bringing the wings overhead and downward below horizontal (Martin and Gavin 1995). When singing, Bobolinks fly in a circular path and point their wings downward, rapidly, bringing them barely to horizontal (Martin and Gavin 1995). During song flight, the white patch on the rump as well as the white scapular plumage is visible (Martin and Gavin 1995). Bobolinks are highly territorial; males engage in displays such as the aerial contest display, chases, and fights (Martin and Gavin 1995). The aerial contest involves two males using their feet and bills to compete (Martin and Gavin 1995).

Males have two song types that may be based on interaction (Wittenberger 1983, Capp and Searcy 1991, Martin and Gavin 1995, Ammer and Capp 1999). They are able to sing multiple variations of the two song types, especially when faced with a potential mate (Ammer and Capp 1999). Bobolink songs are bubbly, complex, and often have 25-50 notes (Martin and Gavin 1995).

There is one record by Perlut (2008) of a female Bobolink losing fertility and exhibiting male plumage characteristics. The author attributes these changes to either infection or disease that would alter hormones. Other abnormalities include a male with spurs on its wing (Coale 1887) and a partially albinistic Bobolink (Eifrig 1915).

Breeding

Bobolinks are polygynous (Martin 1974, Gavin and Bollinger 1985, Wootton and Bollinger 1992, Nocera et al. 2006), but behavior varies geographically, possibly correlating with quality of nesting habitat and food availability (Wittenberger 1978, Martin and Gavin 1995). Bill pigmentation timing in males depends on the photoperiod experienced; the shorter the photoperiod, the longer it takes for pigment to form (Engels 1961). Pairs form after females arrive, and courtship continues until 2.5-3 days before copulation (Martin and Gavin 1995). Pairs may re-form, or females may choose a new mate (Martin and Gavin 1995). Females build nests on the ground (Winter et al. 2006) and lay up to seven eggs at a rate of one egg per day (Martin and Gavin 1995, Bollinger and Gavin 2004). Eggs are gray to brown, varying in color and blotchiness (Martin and Gavin 1995). Incubation lasts 11-13 days (Martin and Gavin 1995, Bollinger and Gavin 2004) and altricial nestlings hatch asynchronously (Martin 1974, Frei et al. 2010). Nestling sex ratios are roughly equal, but male nestlings are larger (Perlut et al. 2014). Males assist the first bonded females in brood care (Martin 1974, Martin and Gavin 1995). All young may not be sired by the same male (Gavin and Bollinger 1985, Wootton and Bollinger 1992). Adults remove shells and fecal sacs (Martin and Gavin 1995). Young fledge 10-11 days after hatching and are able to fly within 16 days (Martin and Gavin 1995). Two broods may occur during the breeding season (Martin and Gavin 1995, Bollinger and Gavin 2004, Perlut and Strong 2011). There is some evidence of cooperative breeding (Beason and Trout 1984, Martin and Gavin 1995). Juvenile Bobolinks scout breeding sites for the next season before migrating (Nocera et al. 2006).

Wintering

Bobolinks form flocks after juveniles are partially independent (Martin and Gavin 1995). Flocks join to form large groups of 25,000-30,000 individuals (Martin and Gavin 1995). Bobolinks remain in flocks during the winter (Di Giacomo et al. 2005, Scheiman et al. 2007), and some males stay together throughout fall migration, winter, and spring migration (Martin and Gavin 1995). Some Bobolinks may inhabit marshes with other Icterid species (Di Giacomo et al. 2005). Bobolinks may use receptors in the ophthalmic nerve to sense magnetic fields for migration (Beason et al. 1995, Beason and Semm 1996).

Habitat

Breeding

Historically, Bobolinks used native prairies for nesting (Martin and Gavin 1995). Deforestation in the northeastern United States resulted in an increase of suitable habitat such as pastures and hayfields (Martin and Gavin 1995). Bobolinks are associated with a mixture of grasses, sometimes sedges, and forb cover (Wittenberger 1978, Martin and Gavin 1995, Delisle and Savidge 1997, Ribic and Sample 2001). Preferred forbs include red clover (*Trifolium pretense*) and dandelion (*Taraxacum officinale*; Wittenberger 1978, Martin and Gavin 1995). Bobolink density increases with vertical structure (Winter et al. 2005). Bobolinks can also be found in alfalfa (*Medicago sativa*) fields (Ribic and Sample 2001), preferably greater than 8 years old (Martin and Gavin 1995, Bollinger et al. 1990). Scheiman et al. (2003) found that Bobolinks were indifferent to the invasive weed, leafy spurge (*Euphorbia esula*). Bobolinks prefer to nest away from forest edges (Winter et al. 2006) and in larger habitat patches (Johnson and Igl 2001, Bollinger and Gavin 2004, Ellison et al. 2013). Return rates to unmowed fields are slightly higher than to mowed fields (Ingold et al. 2010).

Migration

Mixed-age and mixed-sex flocks form in late June, but may not depart until July or August. Before migrating, Bobolinks inhabit freshwater or coastal marshes during molt (Martin and Gavin 1995). Habitat use during migration is largely unknown (Martin and Gavin 1995).

Winter

Bobolinks winter in the Pampas in South America, utilizing a variety of fields from marshes to rice fields. They are often considered agricultural pests in these areas (Martin and Gavin 1995). Di Giacomo et al. (2005) noted that Bobolinks in Argentina may not actually be crop pests and prefer to winter in native grasslands and marshes.

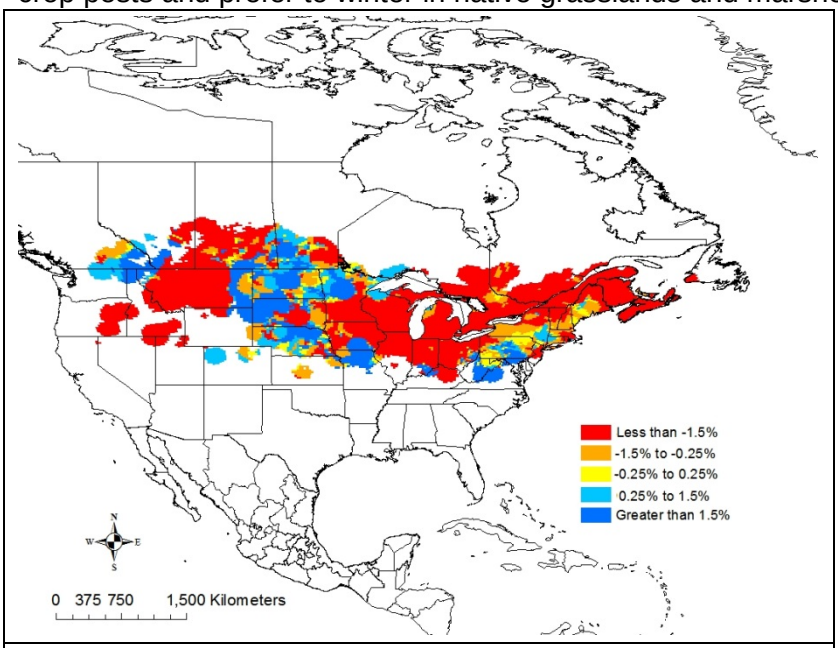

Figure 37. Map of percent change per year in the number of Bobolinks detected during the Breeding Bird Survey for the period 1966-2012 from Sauer et al. (2014). Observations have declined across most of their range, although there is an increase in the number of birds detected in Nebraska and North Dakota.

Population Trends and Estimates

Partners in Flight (2014) estimated that the population consisted of 8 million individuals, with 2.2 million individuals in Canada and 5.8 million in the U.S.. Based on Breeding Bird Survey data, Bobolinks exhibited a decline of 2.2% annually (Figure 37; Table 20). Within Region 6, however, Bobolinks are increasing at a rate of 0.9% annually, driven by significant increases in North Dakota (1.1% annually) and Nebraska (1.9% annually; Table 20).

Threats

Habitat degradation, conversion, and haying

Hay fields have declined in the northeast, and fields are being cut earlier (Bollinger et al. 1990, Martin and Gavin

1995, Norment et al. 2010).This leads to declining habitat and potential loss of nestlings (Martin and Gavin 1995, Kingery 1998). An experimental study by Bollinger et al. (1990) reported 51% mortality of nestlings and eggs during hay-cropping, as well as 24% due to abandonment.

Habitat loss also has an effect on Bobolinks. Grassland habitat loss has resulted in a range reduction in South America (Vickery et al. 2003, Di Giacomo et al. 2005). One metapopulation study in Indiana suggested that habitat loss, rather than stochasticity, was a major threat to Bobolink populations (Scheiman et al. 2007).

Predation

Predation by large birds, including Cooper's Hawks (*Accipiter cooperii*), Sandhill Cranes (*Grus canadensis*), Ring-billed Gulls (*Larus delawarensis*; Bollinger et al. 1990), Short-eared Owls (*Asio flammeus*), and Northern Harriers (*Circus cyaneus*), as well as various mammal and reptile species have caused mortality in Bobolinks (Wittenberger 1978, Martin and Gavin 1995). In some areas, predation is the major cause of nest failure (Kerns et al. 2010), though Perlut and Strong (2011) suggested that cows disturbing nests were a major cause of failure.

Weather

Adverse weather events such as flooding, hail, and cold can negatively affect nestlings (Wittenberger 1978, Martin and Gavin 1995).

Shooting and trapping

Bobolinks may be shot on the wintering grounds where they are considered pests. Males are also sold in pet trade (Martin and Gavin 1995, Vickery et al. 2003, Di Giacomo et al. 2005). In some areas, Bobolinks may be consumed (Martin and Gavin 1995).

Effects of Climate Change

Some climate change models predict a major shift of the breeding range to the north (Schneider and Root 2014). However, Hitch and Leberg (2007) found that Bobolinks had shifted south within the past 26 years.

Effects of Energy Development

Bollinger and Gavin (2004) observed that Bobolinks avoided road edges when nesting. This suggests that increasing road and human activity near nests will cause Bobolinks to avoid those areas. The authors also suggested that chemical waste and pesticides might cause decreased insect availability.

Management

Adults generally show strong site fidelity (Martin 1974, Wittenberger 1978, Fajardo et al. 2009), but will disperse in the event of early harvesting. The strong site fidelity may deter Bobolinks from selecting higher quality habitat. Consistent management of quality habitat would benefit this species (Fajardo et al. 2009).

Mowing should occur annually, but after nesting has occurred (Martin and Gavin 1995, Fajardo et al. 2009). Perlut and Strong (2011) noted that Bobolinks would return to a field within 15 days of mowing. Selective haying may allow farmers to cut fields while maintaining some habitat (Fajardo et al. 2009). Prescribed burning can be utilized, but burns should occur after nesting or prior to Bobolink arrivals (Martin and Gavin 1995). Grant et al. (2010) found that Bobolinks preferred fields 2-3 growing seasons post-burn.

Conservation

Creating or preserving large tracts of grassland habitat that allow Bobolinks to avoid forest and road edges would benefit this species (Johnson and Igl 2001, Ribic and Sample

2001, Bollinger and Gavin 2004, Fletcher 2005, Scheiman et al. 2007, Thompson et al. 2014). Weidman and Litvaitis (2011) suggested, however, that Bobolinks are able to successfully fledge young in small habitat patches with associated edges. Wildlife organizations that promote the preservation of fields also benefit Bobolinks (Fajardo et al. 2009). In the wintering range, preserving grassland habitat is advised (Di Giacomo et al. 2005).

In Missouri, Bobolinks are a wet prairie indicator. The presence of Bobolinks may help managers and conservationists preserve high quality habitat for many species of conservation concern (Thogmartin et al. 2009).

Completed and Ongoing Conservation Actions

Bobolinks have declined throughout their breeding range (Bollinger et al. 1990, Ribic and Sample 2001, Di Giacomo et al. 2005, Fajardo et al. 2009, Frei et al. 2010, Ellison et al. 2013). Some Conservation Reserve Program fields have allowed Bobolinks to nest in undisturbed tracts (Delisle and Savidge 1997).

TABLE 19. Bobolink status rangewide summarized by multiple listing agencies. IUCN is an abbreviation for "International Union for Conservation of Nature" and data comes from IUCN (2014), ABC is an abbreviation for "American Bird Conservancy" and data is from ABC (2012), and "PIF" is an abbreviation for "Partners in Flight" and data comes from PIF (2014). A hyphen (-) indicates a lack of data. For the ABC Conservation Assessment, "Secure" species have no immediate conservation issues, "Potential Concern" species have smaller populations or ranges or at higher rates of population declines, "Vulnerable" species deserve conservation attention, and "At Risk" species need more urgent conservation attention. The "Birds of Conservation Concern" row shows the Bird Conservation Regions (BCR) and US Fish & Wildlife Region where this species is considered to be of conservation concern (USFWS 2008).

IUCN	Least Concern
Federal listing	No
ABC Conservation Assessment	Vulnerable
Birds of Conservation Concern	BCR 23
PIF	U.S. – Canada Concern Species

TABLE 20. Bobolink status summarized by Natural Heritage rankings, BBS trends for 1966 – 2012, BBS trends for 2000 – 2012, and multiple listing agencies. SGCN is an abbreviation for "Species of Greatest Conservation Need". A hyphen (-) indicates a lack of data. For the natural heritage rankings, G = global and S = state, where S5 = secure (common, widespread, abundant, and lacking major threats or long-term concerns), S4 = apparently secure (uncommon but not rare, but with some cause for long-term concern, usually having more than 100 occurrences and 10,000 individuals), S3 = Vulnerable (rare; typically having 21 – 100 occurrences, or 3,000 – 10,000 individuals), S2 = Imperiled (typically having 6 – 20 occurrences, or 1,000 – 3,000 individuals), and S1 = Critically imperiled (typically having five or fewer occurrences, or 1,000 or fewer individuals). Natural Heritage rankings are only for breeding populations. For the BBS trends, data with an important deficiency are labeled as "Insufficient data". The BBS trends are annual changes. Numbers in parentheses are 95% confidence intervals.

	Natural Heritage Ranking	BBS Trend (1966 – 2012)	BBS Trend (2000 – 2012)	State Listing	SGCN
Rangewide	G5	-2.2% (-3.2, -1.8%)	-1.3% (-2.2, -0.4%)	-	-
Region 6	-	0.9% (0.2, 1.5%)	1.6% (0.2, 3.1%)	-	-
Montana	S3B	-2.7% (-4.3, -1.0%)	-1.2% (-5.5, 3.37%)	Species of Concern	Tier III
North Dakota	SNRB	1.1% (0.02, 2.0%)	0.5% (-2.1, 3.1%)	-	Level I
South Dakota	S4B	0.7% (-0.5, 2.0%)	-0.1% (-3.5, 2.9%)	-	-
Wyoming	S2	Insufficient data	Insufficient data	-	Tier II
Colorado	S3B	-	-	-	Species of Greatest Conservation Concern
Utah	S2B	-	-	Species of Concern	Tier II
Nebraska	S4	1.9% (0.1, 3.6%)	2.9% (-0.1, 6.5%)	-	-
Kansas	S1B	Insufficient data	Insufficient data	Species in Need of Conservation	Tier I

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